FINAL

TECHNICAL MEMORANDUM – I-710 CORRIDOR PROJECT EIR/EIS TRAVEL DEMAND MODELING METHODOLOGY

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1.0 INTRODUCTION

This report presents the methodologies and results of the traffic forecasting tasks for the I-710 Corridor Project Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The forecasts are the output of a travel demand model that estimates traffic volumes by vehicle class (e.g., drive-alone autos, shared-ride vehicles, trucks) for a network of roadway links of interest in the study. As will be described later in this report, the computer model produces the traffic forecasts for four different time periods, which together constitute average daily traffic volumes. Additional techniques outside of the model are used to estimate peak-hour traffic volumes for different times of the day.

The traffic forecasts provide critical inputs for a number of subsequent engineering and environmental tasks in the study:

- The traffic forecasts are inputs to traffic operations analysis that characterizes traffic flow conditions and is used by the design engineers to evaluate the geometric design of different alternatives for freeway, ramp, and arterial improvements.[1]
- The traffic forecasts provide inputs for air quality (emissions) models, noise studies, and energy use studies in the environmental impact analysis.
- The traffic forecasts are used to study traffic circulation impacts of the different alternatives.

This report consists of the following major elements. First, the report provides an overview of the methodology used to develop the traffic forecasts. This methodology consists of an adaptation of the Southern California Association of Governments' (SCAG) regional travel demand model. In addition, the methodology applies a number of analytical adjustments (elsewhere referred to as "post-processing") to the results that come directly out of the model in order to produce results that are consistent with base year (2008) observed traffic levels.

The overview of the methodology is followed by a description of key model components, including the SCAG regional travel demand model and the port truck model, which are integrated into this study. The description of the model components includes a summary of key input assumptions, including those that come directly from the SCAG model (and are therefore consistent with assumptions about future population growth and employment in the region, as reflected in the 2008 Regional Transportation Plan (RTP)) and those that were developed for this study and approved by the I-710 EIR/EIS Project Committee and Funding Partners.

[1] Arterial traffic volumes at the ADT level for each alternative are presented in Chapter 9.0 for several key arterial highways. A more comprehensive analysis of arterial traffic conditions is presented in the *Administrative Draft Report Intersection Traffic Impact Analysis Report WBS ID: 160.10.35-040.*

After the model components and assumptions are described, the report presents information about how the model was validated; that is, the model outputs for the base year are compared with actual traffic count data, and adjustments are made to the model to get results that match the existing conditions to the maximum extent possible. In this section of the report, the post-processor methodology is described in detail.

The primary application of the traffic forecast methodology was to evaluate the alternatives being considered in this study. All forecasts were developed for the Year 2035. The report describes the assumptions and procedures for developing the 2035 No-Build forecasts and the results of these forecasts. It then reviews the alternatives that were evaluated and presents a summary of the forecast results.

2.0 OVERVIEW OF I-710 TRAVEL FORECASTING METHODOLOGY

As noted in the introduction, a travel forecasting model is a critical tool for the I-710 Corridor Project EIR/EIS. It is used to forecast demand levels for all of the roadways in the study area, providing input to the design of freeway, arterial, and ramp improvements. This information is also used by traffic engineers to determine whether the various design concepts will be sufficient to relieve bottlenecks, resolve safety hazards and address air quality. Information about traffic volumes and vehicle speeds on different roadways at different times of the day are required inputs to models that estimate vehicle emissions and noise.

In developing a forecasting tool that meets these needs a number of unique features of the I-710 Corridor needed to be taken into account. First, the I-710 Corridor experiences an unusually high volume of truck traffic and truck traffic is anticipated to grow at a faster rate than automobile traffic. So the model needs to be able to accurately represent truck traffic. One important factor contributing to the significance of port truck traffic in the corridor is the presence and growth of the Ports of Los Angeles and Long Beach. The model needs to be able to accurately represent the contribution of port truck traffic. In addressing the role of the ports as a generator of truck traffic in the corridor, the model needed to be able to take into account how factors such as how the use of on-dock and off-dock rail affects truck traffic patterns and how programs like extended gate hours (i.e., the PierPASS OffPeak program) affect the time of day traffic patterns to/from the ports. While many standard travel demand forecasting models focus much attention on modeling how private travelers make choices about which modes of travel to use (single occupancy automobile vs. shared ride vs. transit) this was a less critical issue within the I-710 Corridor because most of the issues revolve around commercial trucks. Nonetheless, automobile traffic remains the dominant class of vehicle traffic on all roadways in the I-710 Corridor so the forecasting tool needs to be able to accurately estimate and forecast auto traffic with a focus on the roadway system as opposed to the transit system. Within the corridor itself, much detail was needed in order to estimate the traffic volumes not only on the I-710 mainline but on ramps, connecting freeways, arterial streets, and intersections.

In developing a forecasting tool for an EIR/EIS for a transportation project of the size and scope of the I-710 Corridor Project, it is desirable to build from a travel demand model that is widely used in the region and which has been approved by the U.S. Environmental Protection Agency (EPA) and the Federal Highway Administration (FHWA) for use in developing regional transportation plans and air quality management plans. The SCAG's 2008 Regional Transportation Plan (RTP) Travel Demand Model is such a model and it provides some features that are very important for the I-710 Corridor EIR/EIS:

- It has a separate truck forecasting component and so is able to forecast truck traffic; and

- It has been integrated with a special model developed by the Ports and is able to incorporate port truck demand taking into account rail mode share, hours of operation, and other features of port operations.

Despite these valuable features, the SCAG 2008 RTP Travel Demand Model would not in and of itself meet all of the needs of the I-710 Corridor Project EIR/EIS.

- The SCAG model is designed to provide forecasts at a regional scale, not at a corridor scale. Therefore it lacks certain details in its depiction of the roadway network that are important for the I-710 Corridor Project EIR/EIS. More important, the SCAG model is developed to provide reasonable forecasts at a regional scale. When it is used to provide forecasts for a much smaller area, such as the I-710 Corridor, it is less accurate. Getting very accurate estimates of ramp traffic volumes, intersection turning movements, and traffic volumes on arterial streets is difficult within an area the size of the I-710 Corridor.

- While the SCAG model includes port trucks in its forecasts, it does not allow for separate tracking of port trucks to see how they contribute to overall truck traffic on specific roadways.

- While the SCAG model has a generic representation of truck traffic in and out of warehouses that produces reasonable results at the regional level, it lacks detail that would produce a more accurate representation of the unique operations of warehouses in the I-710 Corridor that are connected with port operations.

The first of these shortcomings of the SCAG model presents a fairly typical problem encountered when using a regional traffic model for a project level EIR/EIS. Standard practice is to develop a “corridor model” that builds from the regional model but adds a more detailed representation of the roadway network and modifies network characteristics to get better agreement between the model outputs and observed traffic counts for a base year condition.

However, even after making the types of adjustments that are typical in a corridor model, it is often necessary to develop additional methods for adjusting the model results to bring them into close match with base year traffic counts. This method is called post-processing and it is common practice to employ this method in relatively small area corridor studies. Given the unique characteristics of the I-710 Corridor and the existing tools for modeling truck traffic, the travel model alone will not be sufficient to provide the degree of accuracy and detail required for the I-710 Corridor EIR/EIS. The post-processing method that is developed needs to be integrated with the model so that the entire system takes full advantage of what the model does well (e.g., forecast the levels of traffic growth as a function of changes in key socioeconomic and industry growth inputs, route traffic rationally in a very complex and congested roadway network, provide information about vehicle speeds, etc.) while making adjustments to make sure that base and future year traffic volumes are consistent with observed traffic in a very detailed network within the I-710 Corridor. The post-processing component of the traffic forecasting process needs to be easy to follow in that it needs to be based on a set of clearly defined rules for making adjustments that are applied consistently.

This entire system – the corridor model and the post-processor – is titled the I-710 Corridor Project EIR/EIS Traffic Forecasting System and will be referred to as the I-710 Traffic Forecasting System. It has two main components: 1) the I-710 Traffic Model (the corridor model) and 2) the I-710 Traffic Post- Processor. The remainder of this section provides an overview of the I-710 Forecasting System and how it was developed, focusing first on how the 2008 base year I-710 Traffic Model and Post-Processor were developed, and then describing how the 2035 I-710 Traffic Model and Post-Processor were developed. More detailed descriptions of the different components of the I-710 Traffic Forecasting System are provided in later sections of the report along with more detailed descriptions of how the Traffic Forecasting System was developed and how it was applied to develop 2035 No-Build Forecasts. The report concludes with a section describing the traffic forecast results for each of the alternatives that were evaluated with the I-710 Traffic Forecasting System to meet the requirements of the I-710 Corridor Project EIR/EIS.

Figures 1 and 2 provide an outline of how the I-710 Traffic Forecasting System was developed. Figure 1 describes the development of the base year (2008) I-710 Traffic Model and Post-Processor, and Figure 2 describes a similar process for 2035 No-Build I-710 Traffic Forecasting System.

Figure 1. Outline of 2008 Baseline Model Validation/Post-Processing Methodology

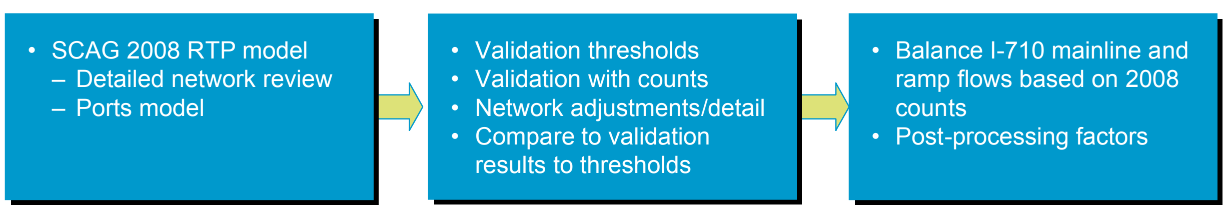
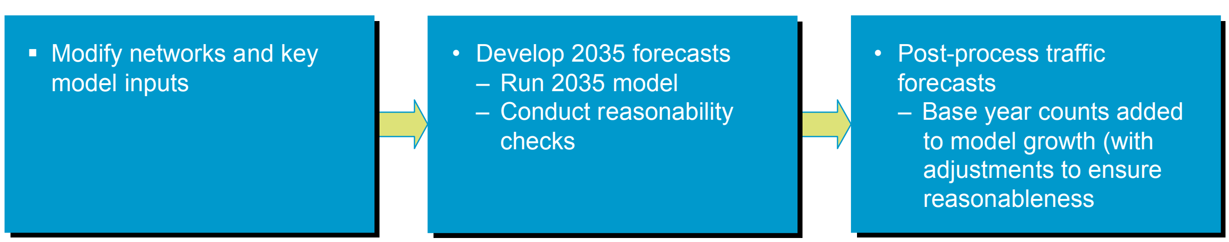


Figure 2. Outline of 2035 No-Build Post-Processing Methodology



As shown in Figure 1, the first step in the process of developing the base year (2008) I-710 Traffic Forecasting System was to develop the I-710 Traffic Model component of the system. As noted previously, the SCAG 2008 RTP Travel Demand Model (the SCAG Model) was used as the platform for I-710 Traffic Model component of the I-710 Traffic Forecasting System. There were two principal categories of changes to the SCAG Model that were needed in order to make it suitable for use as the I-710 Traffic Model. First, since the SCAG model was developed for regional planning applications, it was necessary to conduct a detailed review of the model networks and to make corrections and adjustments to provide more detail and accuracy at the more detailed level of analysis required for this study. These adjustments were necessary for the following reasons:

- The regional model was not always accurate (up to date) in its representation of the number of lanes, directional restrictions, truck prohibitions, or other network features within the I-710 Corridor. While many of these network discrepancies have little impact on regional analysis, for the purposes of the I-710 Corridor Project EIR/EIS and its focus on a much smaller area than is typical in regional studies, errors in network detail could have given erroneous results.

- Detailed traffic operations analysis is required for 121 intersections in the I-710 Corridor in order to meet the design and environmental analysis needs. These intersections had to be explicitly coded into the highway networks.

- Certain features of the roadway network that affect travel times (e.g., "turn penalties" as described in more detail later in this report) needed to be adjusted to get more accurate results as compared to observed traffic counts.

The model and network adjustments are described in more detail later in this report.

One additional enhancement to the SCAG model was required in order to make it suitable for use in the I-710 Traffic Forecasting System. While the SCAG model includes port truck trips it does not separate these as a separate class of trucks. For the purposes of the I-710 Model the SCAG model was modified to allow port trucks to be tracked separately in reporting of traffic volumes on all facilities, especially I-710. This was important for the I-710 Corridor Project EIR/EIS because truck traffic in much of the study area is dominated by port-related truck traffic and it is important to understand how port truck traffic patterns affect the feasibility of different alternatives to be analyzed (especially the alternative that would include the development of a dedicated freight corridor).

A critical step in the development of any traffic forecasting system is to validate the travel demand model by comparing model output for the base year with observed traffic volumes to ascertain how closely the model estimates observe traffic volumes, especially on I-710. The SCAG 2008 RTP model has been validated at the regional level but a more detailed validation of model performance on key roadways and ramps was conducted for the I-710 Traffic Model developed for this study. For the purposes of validating the I-710 Traffic Model and for reporting information of most interest for this study, a Travel Forecast Study Area was identified. The I-710 Travel Forecast Study Area, shown in Figure 3, includes more than just the I-710 freeway and adjacent facilities. Due to the regional nature of corridor travel, the parallel I-605 and I-110 freeways are included in the study area. The study area stretches from the Pacific Ocean to Downtown Los Angeles.[2] Freeway mainline, ramp and arterial traffic counts were collected in 2008 at many locations within the study area and were used for model validation purposes. Model validation targets were established based on industry practice and reasonable expectations for the level of accuracy that can be achieved with a model of this type. The targets provide an indication of the level of deviation from actual counts which the model should achieve. The targets were not established as hard and fast thresholds but rather as an indicator of the relative performance expectations of the model for predicting traffic volumes on different types of facilities in the study area. Ultimately, the I-710 Post-Processor was developed to improve the base year model's ability to replicate traffic volume counts much more closely than could be achieved with the regional model alone. This was particularly important in order to achieve a higher level of accuracy in the forecasts for the freeway mainline and ramps that was needed to inform the geometric design of each alternative. The specific targets used for model validation and the results are presented later in this report.

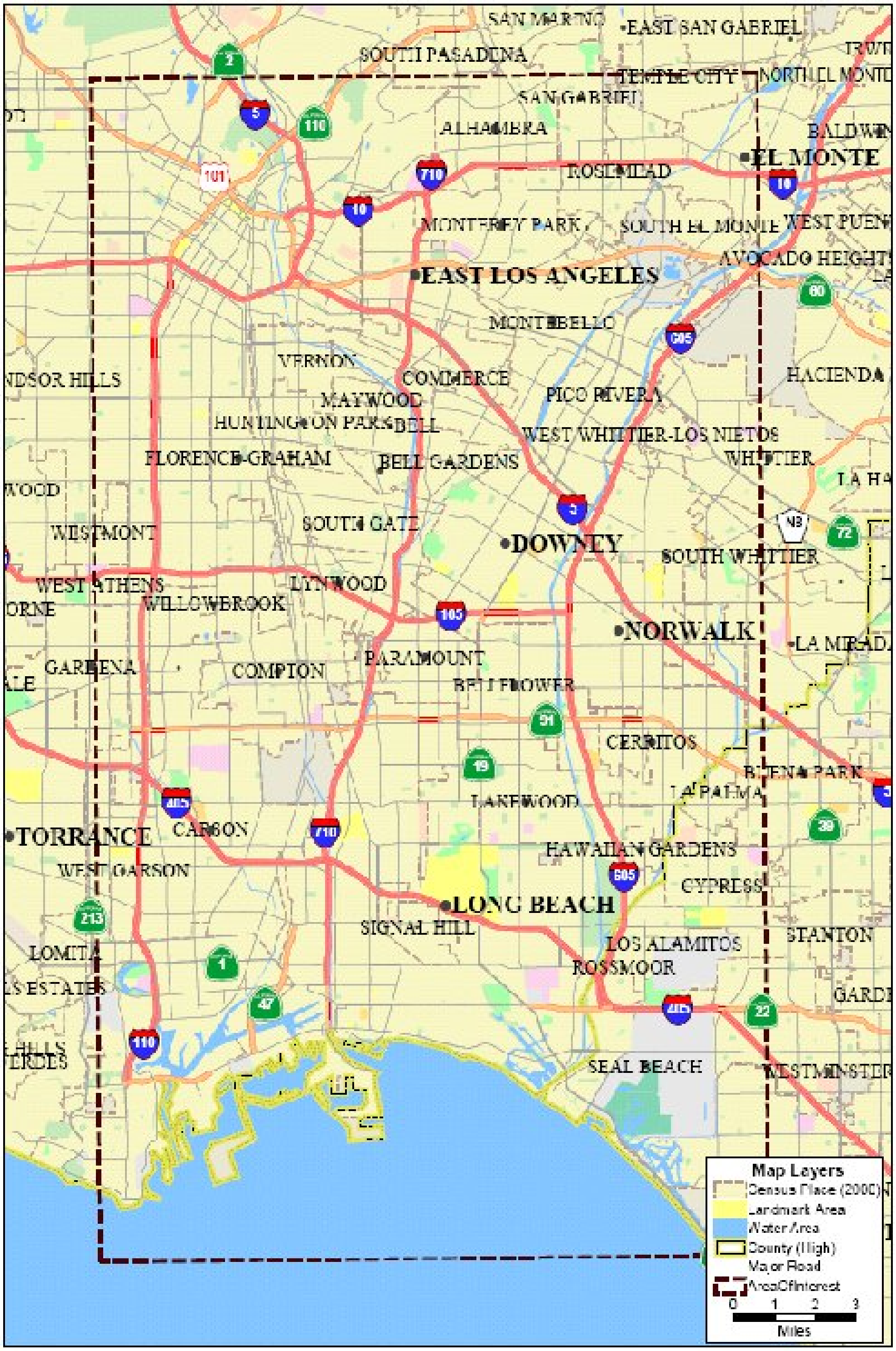
The traffic model estimates of 2008 base year traffic volumes on I-710 were adjusted to better reconcile the model traffic estimates with observed traffic counts. These adjustments to I-710 estimated volumes were done within the constraint of balancing I-710 mainline and ramp volumes to maintain conservation of traffic flow. A problem with a large corridor such as the I-710 Corridor is that traffic counts require several weeks to be collected. Because there is significant day-to-day and week-to-week variation in observed traffic, the balancing of ramp and mainline volumes was designed to compensate for these variations and provide a consistent estimate of observed traffic volumes.

This reconciliation process, which is the final step in developing the base year I-710 Traffic Forecasting System, is referred to as the I-710 base year Post-Processor.

Once the base year validation and post-processing was completed, forecasts for the Year 2035 were developed for the No-Build Alternative and for the project alternatives. Forecast outputs include freeway ramp and mainline volumes, and turning movements at 121 key intersections

[2] It should be noted that even though model validation focused on this study area and many of the results presented in this report are for this study area, the model actually includes the entire SCAG region.

Figure 3. Project Study Area Map



throughout the study area. In order to produce a model roadway network appropriate for the 2035 forecasts, the 2008 network in the I-710 Traffic Model was adjusted to account for completion of traffic improvement projects that will occur between 2008 and 2035. A set of year 2035 input assumptions were established that were consistent with the 2008 SCAG RTP. In the case of port growth and rail cargo mode share, the assumptions approved by the I-710 Corridor Project EIR/EIS Project Committee were used. These assumptions are described in more detail later in this report. The 2035 No-Build I-710 Traffic Model outputs provided forecasts of traffic volume growth as compared to the 2008 I-710 Traffic Model outputs and this growth was applied to the post-processed base year traffic volumes to produce an adjusted forecast. A number of reasonableness checks were conducted (as described later in this report) to ensure that the adjustment rules developed for the base year I-710 Post-Processor produced results that were consistent with the general traffic patterns produced by the model but with traffic volumes consistent with the base year traffic counts and the level of growth predicted by the model. If the reasonableness checks revealed any problems with the post-processor logic, the post-processor rules were adjusted accordingly. After the reasonableness checks were completed a similar post-processing procedure as described for the base year was used to balance and refine all of the year 2035 traffic volumes on the I-710 mainline and ramps.

3.0 SCAG TRAVEL DEMAND FORECAST MODEL SYSTEM

3.1 COMPONENTS OF SCAG 2008 RTP MODEL

SCAG's 2008 Regional Transportation Plan (RTP) Travel Demand Model has been widely used in the region and provides important features for the I-710 Corridor EIR/EIS. The SCAG (RTP) travel demand model is a four step model comprising; trip generation, trip distribution, mode choice, and traffic assignment. The base year model system is comprised of 4,192 Traffic Analysis Zones (TAZ) and 62,893 network links (which represent segments of roadways) covering the entire six county SCAG region (Ventura, Los Angeles, San Bernardino, Riverside, Orange, and Imperial Counties). Trip generation estimates the number of trips that originate and terminate in each zone. Trip distribution links the origins and destinations of trips (i.e., how many trips travel from zone a to zone b). Mode choice for passenger trips determines whether trips are made by auto (drive alone, share ride two passengers, shared ride three passengers), transit, or non-motorized (walk, bicycle). Traffic assignment determines the routing of vehicle trips on the roadway network. (Transit assignment determines routing of transit passenger trips on the transit system.)

The model forecasts traffic for an average midweek spring weekday (Tuesday, Wednesday, and Thursday), and divides the day into four time periods (see Table 1). A separate traffic assignment is conducted for each time period to take into account the varying roadway congestion conditions in each of the four time periods on vehicle route choice.

Table 1. SCAG RTP Model Time Period

	Time
AM Peak Period	6:00 a.m. to 9:00 a.m.
Midday Period	9:00 a.m. to 3:00 p.m.
PM Peak Period	3:00 p.m. to 7:00 p.m.
Night Period	7:00 p.m. to 6:00 a.m.

The SCAG RTP model also includes a separate set of procedures for forecasting truck traffic (also known as the Heavy-Duty Truck (HDT) model). There are three major components of the HDT model:

- The external model which incorporates trip generation and trip distribution of interregional truck trips based on commodity flow data. [3] The commodity flow data

[3] The commodity flow data used in the 2008 version of the model is based on the 1996 forecast of commodity flow data contained in the Caltrans Intermodal Transportation Management System (ITMS) database. This forecast was updated during the preparation of the 2008 RTP using the FHWA Freight

provides information about the tonnage of each commodity (e.g., machinery is a type of commodity) that moves annually between origins and destinations (i.e., between counties in the SCAG region and states in the rest of the U.S.) by each freight transportation mode. The model uses various factors developed from published and survey data to estimate daily truck trips from the annual tonnage flows.

- The internal model which incorporates trip generation and trip distribution of intra-regional trips using procedures similar to those used to generate and distribute person trips.
- The special generator models. At the present time, the special generator models include the Ports of Long Beach and Los Angeles as special generators and use the same trip generation and distribution process as incorporated in the separate Port model described later in this report.

The HDT model combines outputs of all three of the HDT component models described above into a single trip table, and this is combined with the auto trip tables from the rest of the SCAG travel demand model during the traffic assignment process (i.e., all vehicle classes are assigned in a multiclass assignment process).[4] The results of traffic assignments for the SCAG model are reported for six vehicle classes:

- Drive alone autos;
- Shared ride (2 occupants) autos;
- Shared ride (3+ occupants) autos;
- Light heavy-duty trucks (8,500 to 14,000 lbs. Gross Vehicle Weight);
- Medium heavy-duty trucks (14,001 to 33,000 lbs. Gross Vehicle Weight); and
- Heavy heavy-duty trucks (more than 33,000 lbs. Gross Vehicle Weight).

The basic structure and components of the SCAG 2008 RTP model were preserved in the development of the I-710 Traffic Model. That is, no changes were made to the trip generation

Analysis Framework (FAF) data set which provides control totals for the commodity flows at the metropolitan area level of detail. The FAF data set also includes forecasts which were used to update the ITMS forecasts. The commodity flow data base is being updated for the 2012 RTP using a proprietary commodity flow database purchased from IHS Global Insight.

[4] As will be described in more detail, for the I-710 Corridor Project EIR/EIS, the SCAG model was modified to break out port trucks as a separate vehicle class. The trips produced by the SCAG external and internal HDT model are thus called "nonport trucks" in the I-710 Model.

and trip distribution of auto and nonport trucks. Port trucks were generated and distributed using the Ports travel demand forecast model, and the inputs and outputs of this model were provided by the ports to be consistent with cargo growth and cargo mode share assumptions adopted for this study (see section below on Port Travel demand forecasting). Development of the port trucks trip generation and distribution model components are explained in detail in a separate section of this report.

Table 2. Basic Components of the I-710 Traffic Model System

Model Stage	Auto and Nonport Trucks	Port Trucks
Trip Generation	Same as SCAG Model	From Ports Model
Trip Distribution	Same as SCAG Model	From Ports Model
Mode Choice	Same as SCAG Model*	Assumed Railroad and Truck Shares*
Traffic Assignment	Same as SCAG Model	Added New Port Trucks Vehicle Class

* For the Build Alternatives (5A and 6A/6B), the auto trip tables were reduced by 2.8 percent to account for transit improvements in the study area.

3.2 ADAPTATION OF SCAG 2008 RTP MODEL FOR I-710 EIR/EIS

While the SCAG RTP travel forecasting model has a number of useful and unique features important for analysis in the I-710 EIR/EIS that were described in the previous section, this model would not in and of itself meet all of the needs of the I-710 Corridor Project EIR/EIS. The project team employed standard practice by developing a “corridor model” that was built from the regional model but a more accurate and detailed representation of the roadway network and network characteristics were added to get better agreement between the model outputs and actual traffic counts for the 2008 base year condition.

In order to support engineering design decisions and detailed traffic operations analysis, as required in a project such as the I-710 Corridor Project EIR/EIS, it is often necessary to go beyond a traditional corridor travel demand model and to make additional adjustments to the raw forecast model results. These additional adjustments, referred to as post-processing, involve matching model outputs closely to actual counts for a base year, ensuring that traffic flows are conserved along the freeway when ramp volumes are taken into account (a step which is necessary when counts for different locations on the freeway and ramps are taken on different days), and applying these adjustments to the forecasts. This provides a higher level of accuracy and detail on key roadways and ramps which is necessary to support engineering design and traffic operations analysis. The post-processing is only done for selected key locations – in this study it was used for the I-710 mainline and ramps and key arterial intersections. The I-710 EIR/EIS validation and forecasting efforts – including the post-processor development – are discussed later in this report.

4.0 PORT TRAVEL DEMAND FORECAST MODEL COMPONENT

As described previously, the trip tables that represent vehicle trips to and from the San Pedro Bay Ports area that are included in the SCAG RTP model are outputs of the port trip generation model and trip distribution process. The ports maintain their own model system, used primarily to assess the ground transportation system in the immediate Ports vicinity. The port trip tables (origin-destination matrices of trucks to/from zones in the port area) from the port model system were incorporated in the SCAG 2008 RTP model system. However, the port trip tables used in the 2008 RTP are somewhat out of date and needed to be adjusted with respect to overall forecast cargo volumes and mode split to be consistent with forecast assumptions adopted for the I-710 Corridor Project EIR/EIS.

At the same time that the I-710 traffic forecasting work was being conducted, the Port of Los Angeles was initiating work on the EIR for a new near-dock intermodal terminal, the Southern California Intermodal Gateway (SCIG), and they had produced preliminary trip tables for the No-Build case for that EIR/EIS that were generally consistent with cargo forecast and rail mode share assumptions that were adopted for the I-710 Corridor Project EIR/EIS Traffic Model. These preliminary SCIG trip tables were obtained and used for the I-710 process.[5]

This section describes the procedures, inputs, and outputs associated with the development of the 2035 port trip tables for the I-710 Traffic Model. The section is organized as follows – the first section includes a discussion of the 2035 QuickTrip files (which are used for port truck trip generation). The next section presents the port trip distribution procedures used to develop the port trip tables.

4.1 2035 QUICKTRIP MODEL INPUTS

The container truck trip generation model for the San Pedro Bay ports is referred to as QuickTrip (QT). QT is a spreadsheet model, which uses the key inputs presented below to

[5] The SCIG EIR/EIS and the I-710 Corridor Project EIR/EIS were conducted in parallel. While this allowed the I-710 project to take advantage of certain elements of the modeling work done for the SCIG project (and vice versa), the parallel schedules made it impossible to ensure that the model inputs and outputs of the two projects were entirely consistent. The preliminary SCIG port trip tables were consistent with the assumptions for port growth, operations, and mode split adopted for the I-710 project and were, thus used for the I-710 modeling. There may be subsequent refinements of the port trip tables that are uniquely appropriate to the SCIG analysis that were not incorporated in the I-710 Corridor Project EIR/EIS.

estimate the number of inbound and outbound truck trips[6] at each marine terminal for each hour of the day:

- **Peak monthly TEU[7] throughput for each terminal.**
- **Cargo Mode shares.** Share of total TEU throughput for each terminal associated with on-dock intermodal (loaded container imports and exports), off-dock intermodal (loaded container imports and exports), local imports (loaded containers destined for local markets), local exports (loaded containers from local exporters), and empties arriving from or returning to overseas locations.
- **Empty container management (ECM).** Empty container re-use factors representing the share of empty containers (associated with import loads) that are transferred directly between importers and exporters without being sent back to the ports for storage.
- **Gate shifts.** Share of daily truck traffic for each terminal that occurs during each of the three operating shifts (day shift: 8:00 a.m. to 5:00 p.m.; night shift: 6:00 p.m. to 3:00 a.m.; and hoot-owl shift: 3:00 a.m. to 8:00 a.m.)[8]

Using the above inputs, the outputs generated by the QT model include total daily (as well as for each hour-of-day) truck trips originating and terminating at each terminal for bobtails, chassis, empty containers, and loaded containers. Each of these categories of truck trips is described below:

- **Bobtails.** A tractor or power unit that is not hauling a trailer unit.
- **Chassis.** Containers are mounted on a separate chassis that is then connected to the tractor or power unit. In the port model, the category of truck called "chassis" refers to a tractor pulling an empty chassis with no container loaded on it. This type of operation is associated with re-positioning of chassis after containers are delivered.

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[6] The port model also provides trip tables for auto trips made by employees going to and from marine terminals. The auto trips are estimated separately from the QT model and are based on surveys of port employee travel behavior. Port auto trips were included in the port trip tables produced for the I-710 Corridor Project EIR/EIS and are based on the same growth assumptions as are the truck trip tables.

[7] A Twenty-Foot Equivalent Unit (TEU) is the standard unit to express container capacity. A TEU is a representation of an (usually) a container measuring 8 feet wide, 8 to 9½ feet tall, and 20 feet long.

[8] Under current operating agreements, the marine terminal gates close for one hour in the evening between the end of the day shift (at 5:00 p.m.) and the beginning of the night shift (at 6:00 p.m.). However, the QT model does not account for this closure.

- **Empty containers.** A tractor pulling a trailer with an empty container.
- **Loaded containers.** A tractor pulling a trailer with a loaded container.

4.2 PORT TRUCK TRIP TABLES DEVELOPMENT

This section describes procedures used to generate the 2035 port trip table, based on the truck trip generation outputs from the 2035 QT model. Truck trip distribution refers to the link between origins and destinations of trips. For port truck trip distribution, one trip end is always at the port and the other trip end is outside of the port (and is referred to as the "nonport trip end"). Separate truck trip distribution procedures were used for off-dock intermodal trips (trips between the ports and off-dock intermodal terminals), and local trips (trips associated with local cargo moving to/from warehouses, distribution centers, manufacturing facilities, transload facilities, etc.). These procedures are discussed below.

4.2.1 Off-Dock Intermodal Truck Trip Distribution

The first step in the distribution process for off-dock intermodal truck trips was the estimation of total trips generated by the ports that are associated with off-dock intermodal using the QT model and assuming that all trips are off-dock intermodal trips and calculating the number of TEUs that are destined for off-dock intermodal terminals originating and terminating at each marine terminal. It is further assumed that 6 percent of the total TEUs at the ports are empty containers moving via off-dock intermodal. The resulting output from the QT files based on the above mode share assumptions include the total daily and hour-of-day truck trips (bobtails, chassis, loaded and empty containers) associated with off-dock intermodal cargo.

The general approach to distributing trips to/from off-dock terminals is to assume that trips in the future will be distributed among the various off-dock terminals in the same proportion as they are distributed today. However, as was discussed in the Railroad Goods Movement Study conducted for the I-710 Corridor Project EIR/EIS[9], there will be insufficient capacity at the existing off-dock intermodal terminals to handle the forecast growth in cargo, especially when domestic intermodal demand is taken into account. Further, as noted in that report, there is some uncertainty as to how this capacity shortfall will be addressed. The preference of the BNSF for handling its capacity needs when Hobart Yard reaches capacity is to construct a new near-dock intermodal terminal, SCIG, shift all of their international off-dock intermodal to this new yard, and use capacity at Hobart to handle growth in domestic traffic. Since the SCIG project is undergoing its own environmental review process concurrent with the I-710 Corridor Project EIR/EIS, the assumptions adopted for the I-710 Corridor Project EIR/EIS about future intermodal capacity are that SCIG would not be built and the overflow of intermodal traffic that

[9] Final Technical Memorandum – I-710 Railroad Goods Movement Study, WBS Task ID: 160.10.50, February 3, 2009.

could not be accommodated at Hobart Yard would be absorbed at a new intermodal terminal built somewhere in the Inland Empire or further northeast. This is consistent with the assumptions used to develop the preliminary trip tables for the SCIG EIR/EIS that were the basis of the port component of the I-710 Corridor Model. The specific assumption made in the preliminary SCIG trip tables is that the amount of intermodal traffic that would be handled at SCIG if it were built is the amount of traffic that would need to be accommodated at a new inland intermodal yard (assumed for modeling purposes to be located where BNSF's existing San Bernardino yard is located) if SCIG were not built.

The analysis also assumes that there will be no expansion of the UP's ICTF intermodal terminal. As noted in the Railroad Goods Movement Study, this expansion also undergoing environmental review and the expansion project was therefore not included in the forecast assumptions. Instead, the share of intermodal traffic using the UP's East Los Angeles Intermodal terminal is assumed to accommodate some of the traffic that the UP is unable to accommodate at the existing ICTF while some of the traffic is assumed to be allocated to a new terminal represented by the San Bernardino yard as was assumed with the overflow BNSF traffic.

The total remaining off-dock intermodal truck trips generated by the ports are distributed to each of the off-dock intermodal terminals in the region based on the following inputs:

- Current share of off-dock intermodal truck trips associated with each off-dock terminal; and
- Share of the capacity at each off-dock intermodal terminal available for international cargo.

Assuming that the current shares of off-dock intermodal trips associated with each off-dock terminal would apply in 2035, these shares are applied to the 2035 off-dock intermodal trips generated by the ports to estimate the total trips moving to/from each off-dock terminal. Since these distributions will be governed by available capacity at each terminal, these trips moving to/from each intermodal terminal are compared against the future capacity at each terminal available for international cargo.[10] If the truck trips at any individual terminal exceed the capacity, the overflow may be assigned to one of the other terminals that handles international cargo and which has capacity.

4.2.2 Local Truck Trip Distribution

Port truck trips associated with local cargo were estimated by subtracting the off-dock intermodal truck trips from the total port truck trips for bobtails, chassis, loaded, and empty

[10] Off-dock rail yard capacities and share of capacity used for international cargo were obtained from "San Pedro Bay Ports Rail Study Update," prepared for POLB and POLA by Parsons, December 2006.

containers. These trips are then distributed based on port truck origin-destination (O-D) distributions developed from gate surveys conducted at the San Pedro Bay ports in December 2004. These surveys, conducted at marine terminal gates, obtained responses from truckers on their last stop and next stop as they entered or departed the terminal gates. These responses were used to develop O-D distributions for port truck activity. In the absence of other information, it was assumed that these distributions would be applicable to local port truck trip activity in 2035. This is consistent with the approach that was used in the SCAG 2008 RTP. The application of this approach resulted in the development of port truck trip tables for local truck trips by time of day (AM Peak, Midday, PM Peak, and Night). This approach does imply that a substantial amount of growth in port cargo will need to be handled in the same locations where existing warehouses and transload facilities are and a substantial fraction of these warehouses are currently in the model study area. There is little (or no) available land for expanding warehouses in the study area; therefore, growth of trips to study area warehouses could only be accomodated if these warehouses have idle capacity, are handling domestic cargoes that can be displaced to other warehouses outside of the study area, or if existing warehouses can be made more efficient. Currently, there are efforts underway at SCAG to investigate regional warehouse capacity to handle forecast international cargo volumes and potential shifts in the future locations of warehousing activity in Southern California. However, until this analysis is completed, the SCAG RTP model and the port model continue to use the distribution pattern for port trucks described previously. The effects of this assumption on forecast I-710 truck traffic were assessed in a sensitivity test described in Section 10 of this report.

Once the trip tables for off-dock intermodal trips and local truck trips are developed for the port area, they are combined in a single trip table and this is added to the trip table for nonport trips already included in the SCAG RTP model. To be consistent with the truck classification used in the SCAG RTP model, all port trucks are classified as heavy-heavy duty trucks. As noted previously, in the I-710 Corridor Model, port trucks are accounted for as a separate vehicle class so that port-related traffic can be accounted for separately in the model results.

5.0 MODEL VALIDATION

The objective of model validation for the I-710 Traffic Model was to establish model performance targets to assess the ability of the model to estimate traffic volumes to match a robust database of traffic counts in the study area. The SCAG 2008 RTP Model was validated at the regional level in order to meet SCAG's regional planning needs. There were 23 regional screenlines[11] used to validate the regional model – only one of these regional screenlines crosses I-710 in the study area. The validation forecasting level of detail for the I-710 EIR/EIS has been conducted at a far greater level of detail, with multiple corridor screenlines, as well as validation analysis for each individual I-710 ramp and mainline segments throughout the entire corridor.

The I-710 Traffic Forecasting System began with the SCAG 2008 RTP travel demand model as a starting point, but it was clear a more focused validation in the I-710 study area was needed to demonstrate that the model provides credible and explainable forecasts and attendant output measures needed for the I-710 Corridor Project EIR/EIS. A set of validation targets were established for the corridor for different vehicle classes and facility classes (ramps, I-710 mainline and arterials), and for a series of screenlines running east-west across the I-710 facility and that include a number of nearby major arterials, as well as the I-710 itself. Validation results are described later in this section.

Without conducting new trip generation and origin-destination surveys, there are a limited number of options to affect the performance of a travel demand forecast model. These techniques are described later in this report.

However, it is useful to note that while a few model validation targets were not met, the overall viability and reasonableness of forecasting efforts were nonetheless realized. In order to enhance the entire forecasting process to achieve even higher levels of accuracy for critical facilities in the corridor, a traffic post-processor was developed and used in conjunction with the model validation efforts. As described previously, post-processing of model traffic forecasts is common practice employed for corridor studies to refine the accuracy of the traffic forecasts, particularly for use in support of preliminary engineering-level development of the design of the highway alternatives. The travel model alone was not sufficient to provide the degree of accuracy and detail required for the I-710 Corridor Project EIR/EIS given the unique characteristics of the I-710 Corridor. The post-processing portion of the traffic forecasting process was designed to enhance the model but to be completely transparent, based on a set of clearly defined rules for making adjustments that were consistently applied for all forecasts.

[11] A screenline is an imaginary line that crosses multiple parallel roadways. One part of regional model validation is collecting traffic counts for all of the major parallel roadways on each screenline and trying to get the model to produce results that match the counts.

5.1 TRAFFIC COUNT DATA

Model validation requires a good set of traffic counts against which model results can be compared for a base year. An extensive set of traffic counts were collected during the spring of 2008 and were used for validation of the I-710 Traffic Model. These traffic counts were essential in the overall validation process to ensure a comprehensive representation of traffic conditions throughout the I-710 EIR/EIS corridor.

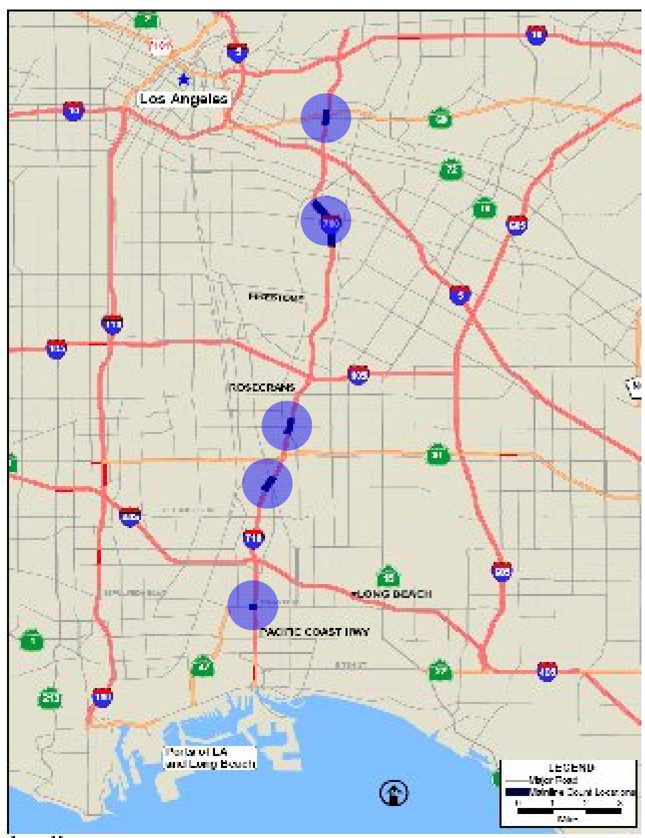
Traffic counts were collected at I-710 mainline locations, at numerous ramp locations, and on several parallel arterials in order to develop validation screenlines. The count data were summarized and geocoded to fit the SCAG model time periods and vehicle classifications. In addition, six I-710 mainline Caltrans counts were used to validate the model. Each of these different data sets is described below.

5.1.1 Mainline Counts

As shown in Figure 4, mainline counts were taken on I-710 at five locations. The counts were taken in both directions at each location (northbound and southbound). The mainline counts were 15-minute vehicle classification counts taken for 12 hours (7:00 a.m. to 7:00 p.m.). The following five vehicle classes were tabulated in the count data:

1. Cars, pickups, buses;
2. Two-axle trucks;
3. Three-axle trucks;
4. Four-axle trucks; and
5. More than five-axle trucks.

Figure 4. Hourly Total Vehicle Count Locations



Full vehicle classification counts on the I-710 mainline were critical to ensuring that the model was accurately reflecting not only overall traffic volumes but volumes by vehicle class and time of day. These vehicle classifications of traffic count data were important for the traffic forecasts in order to determine peak volume periods for the different vehicle classifications (as noted above, forecasts of autos, port trucks, and nonport trucks were each prepared). The locations of the counts were selected to reflect locations with high truck or auto volumes and where traffic volumes and vehicle class composition were expected to change significantly based on current plans and forecasts.

5.1.2 Screenline Counts

As illustrated in Figure 5, counts were also collected on three east-west screenlines that include north-south arterials. Since it can be difficult to get good detailed model results on arterials (particularly for trucks where overall volumes are relatively low), screenline counts help to determine if the overall trip generation and distribution patterns in the model are reasonable. The screenline counts were 15-minute counts collected over 24 hours. The three screenline locations were south of Pacific Coast Highway, south of Rosecrans, and north of Firestone. The counts are of total vehicles (i.e., not vehicle classification counts).

5.1.3 Ramp Counts

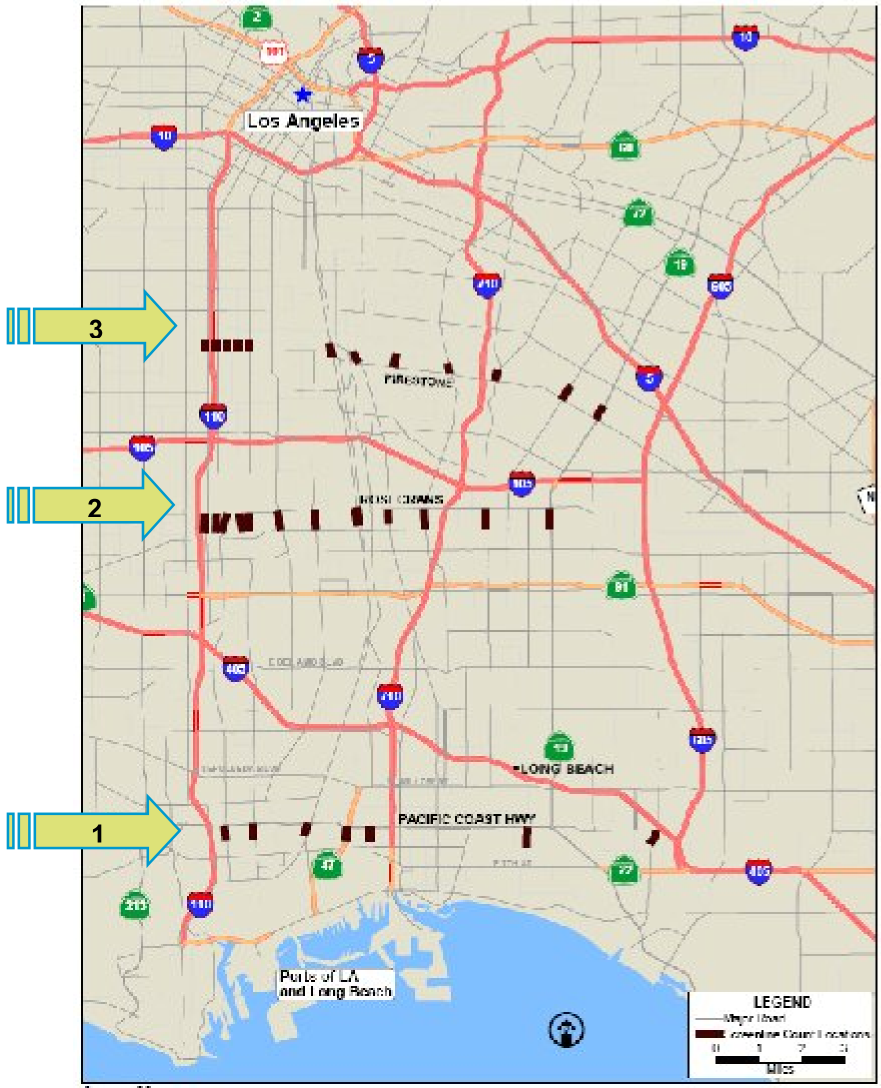
Ramp counts were collected at all locations along the I-710. These counts were 15-minute counts collected for 24 hours. The counts are of total vehicles.

Count data were adjusted when traffic count time periods did not precisely conform to SCAG model time periods. Intersection turn movement counts were also collected, and these data were incorporated in the intersection post-processor and were also used for traffic impact analyses. Intersection traffic count data were collected for one-hour time periods.

5.2 TRAFFIC ASSIGNMENT MODEL VALIDATION TARGETS

Model validation targets were established before applying the model to the 2008 base year. This was done to ensure that validation targets would be objectively set. The key measure of model validation here is percent root mean square error (percent RMSE), comparing model results to count data. Root mean square error is a statistical measure that corrects for the sign of the error. For example, in a set of validation results, sometimes the difference between counts and model results will be positive and sometimes they will be negative. Cumulative errors, if these negative and positive differences are added together, could seem small (as negative and positive errors offset each other) and this will mask the true deviation between the model results and the validation counts. RMSE adjusts for sign difference and thus provides a better measure for overall error rates. Subarea-level traffic validation was conducted using the counts described in the previous section. The 2008 model application was validated for three time periods:

Figure 5. Screenline Count Locations



1. Daily (24-hour period – which is a combination of AM, midday, PM, and night periods);
2. AM peak period (three-hour peak period from 6:00 a.m. to 9:00 a.m.); and
3. PM peak period (four-hour peak period from 3:00 p.m. to 7:00 p.m.).

The most comprehensive document on model validation in print is the *Model Validation and Reasonableness Checking Manual* (FHWA, February, 1997) which provides guidelines for best practice but does not identify a clear set of standards that must be followed. In addition, several states including California, Oregon, and Tennessee, have also published their own travel demand model development and application guidelines, including a section on model validation. These documents were all consulted in development of validation targets for this project.

Traffic assignment validation involves comparing model generated link traffic volumes compared to traffic counts. These comparisons can be made at various levels:

- Geographic Areas of the Study Area
- Functional Classification of Roadways
- Screenlines
- Link-Specific Comparisons

Modeled mainline and ramp vehicle volumes were compared to the observed traffic counts. Validation summaries were prepared for the entire I-710 freeway – both mainline and ramp locations.

Validation targets for each of the roadway functional classification categories are developed before model runs are conducted so to provide an acceptable level of accuracy for the purposes for which the traffic forecasts are required (e.g., freeway operations analysis, air quality and noise impacts estimates, etc.). The validation targets were vetted by the Traffic Technical Working Group prior to completion of project forecasts. Validation targets are summarized in Table 3 below.

Table 3. Aggregate Validation Targets for Highway Traffic Assignments

Link Categories	Target % RMSE
Freeway	35%
Freeway Ramps	55%
Arterial	35%

Source: Cambridge Systematics, Inc., 2009.

RMSE = Root mean square error

5.3 Model Enhancements and Network Corrections

Prior to applying the I-710 Traffic Model System for validation, the highway network was carefully reviewed and corrections were made within the Study Area before being used for the project model runs. Appendix A lists the network changes that were applied to the 2008 base year and future year No-Build networks.

The highway network detail was enhanced within the study area to extract detailed intersection turning movements information from the model. This involved coding each of the 121 study area intersections defined for detailed traffic analysis so turn movements could be readily extracted from each model run.

5.3.1 Turn Penalties

Turn penalties were added to improve the traffic assignment. Turn penalties add a time penalty when moving from one road to another and these can be varied for individual intersections in the model. Since the model routes traffic to minimize the amount of travel time between and origin and a destination, a turn penalty will tend to cause certain traffic flows to avoid particular turns, influencing routes. This technique can be used to adjust routings so that traffic flows on particular roads from the model produce predictions of traffic volumes that are more consistent with observed counts on those roads. Mostly, one or two minute turn penalties were added to a select set of link segments to improve the traffic assignment. Link penalties were added when base year modeled traffic volumes greatly exceeded observed counts. Please see Appendix B for a list of turn penalties applied during model validation.

5.3.2 Port Trucks Vehicle Classification

The traffic assignment process was enhanced to report port trucks as a separate vehicle classification in the traffic assignment. Port truck trip tables, developed originally from the Port Model, were split out from the heavy duty truck vehicle classification in the SCAG model so port and nonport trucks are reported separately. The development of the port truck trip table is explained in detail Section 4.0 of this report.

5.3.3 Passenger Car Equivalent (PCE) Factors

Table 4 describes the vehicle classes and passenger car equivalent (PCE) values used in traffic assignment. PCEs are used to determine travel demand (i.e., volume) when calculating roadway volume-to-capacity (V/C) ratios, the basic measure of roadway congestion. Since large trucks take up more space than do automobiles, PCEs are used to more accurately represent the effect of trucks on utilization of roadway capacity as quantified by V/C ratios. Port trucks are considered to be heavy, heavy-duty trucks and so an average PCE value of 2.0 was used for these trucks.

Differentiating PCEs for autos and trucks is important to properly represent the impacts of freeway congestion. If heavy heavy-duty trucks used the same PCE value as autos, the forecasts would underestimate the levels of traffic congestion, particularly for these freeway and arterial segments with high volumes of HHDTs.

Table 4. Systemwide Passenger Car Equivalents by Vehicle Class

Vehicle Class	Passenger-Car Equivalents
Autos and light trucks	1.0
Light Heavy-Duty Trucks (Nonport Trucks)	1.2
Medium Heavy-Duty Trucks (Nonport Trucks)	1.5
Heavy Heavy-Duty Trucks (Nonport Trucks)	2.0
Port of Long Beach/Los Angeles Trucks	2.0

Source: Southern California Association of Governments.

5.4 SCAG Model Run Process

A complete model run with five feedback iterations was performed. Feedback iterations, or "loops," are used in the model system so congested speeds from traffic assignment are used in mode choice and trip distribution. If congested speeds were not fed back to prior model steps, the level-of-service variables in mode choice (in this case, congested travel times) would not be consistent with traffic assignment assumptions. The intention of the feedback process in the SCAG model is to match closely the speeds used in the distribution step with the congested speeds in the final output of the traffic assignment step. The congested speeds obviously also affect the level-of-service variables in mode choice but that is not the primary reason the feedback through distribution is implemented in the SCAG model.

Speeds, thus travel times, affect the length of the trips in the distribution trip tables. Higher speeds result in longer trips and therefore increase the VMT, while lower speeds result in shorter trips and decrease the VMT.5.5 Vehicle Class Validation Results

Table 5 presents validation statistics by facility type for the eleven freeway mainline locations, all freeway ramps, and for all arterial locations where traffic counts were collected. Validation statistics were compiled for AM and PM peak periods. Freeway mainline and ramp validation targets are met for AM and PM peak periods, with freeway results well within the target thresholds. Arterial validation targets were not met, although the arterial results were not far off from the targets. Arterial validation is often difficult to achieve because small errors on roads with low traffic volume result in higher percentage errors than they do on roads with higher traffic volumes, and arterials have relatively low traffic volumes, especially for trucks.

Table 6 presents validation statistics for the five locations on I-710 where vehicle classification counts were collected. In general, the validation results show a better model match for autos (RMSEs between 6 and 14 percent, depending on direction and time period) than for trucks (RMSEs between 20 and 31 percent). However, although validation targets were not established by vehicle class, combined auto and truck class root-mean-square-error (RMSE) errors were within the thresholds set in Table 5 in all instances.

Table 5. Validation Results by Functional Classification

	Percent RMSE		
Functional Class	**Target**	**AM Peak Period**	**PM Peak Period**
I-710 Mainline	<35%	13%	25%
Ramps	<55%	44%	48%
Screenline Arterials	<35%	41%	42%

Source: Cambridge Systematics, Inc., 2009.
RMSE = Root mean square error.

Table 6. Mainline I-710 Traffic Validation Results – By Time Period and Vehicle Classification

	Percent RMSE					
	Southbound			Northbound		
	Auto	**Truck**	**Total**	**Auto**	**Truck**	**Total**
AM Period	6%	20%	5%	10%	21%	7%
MD Period	14%	26%	11%	12%	23%	8%
PM Period	14%	21%	13%	11%	31%	11%

Source: Cambridge Systematics, Inc., 2009.
RMSE = Root mean square error.

Table C.1 in Appendix C shows directional AM peak, midday, and PM peak-period vehicle classification validation statistics for each of the five I-710 mainline locations for which 12-hour vehicle classification counts were collected. For this comparison, autos and trucks are separately compared. In general, the model shows somewhat better validation statistics for autos than for trucks.

The I-710 mainline validation comparisons were prepared for six other mainline locations where total counts for each hour in an average 2008 weekday were collected. Vehicle classification data is not available for these other six locations. The model percent difference from counts is within 15 percent for all but two locations – North of I-105 (Southbound) and North of I-10 (Northbound). See Table 7.

Table 7. I-710 Mainline Daily Model Validation Results

I-710 Mainline Location	Dir	Count	Model	Difference Numeric	Difference Percent
North Of Pacific Coast Highway	NB	77,200	72,000	-5,200	-7%
	SB	78,400	68,900	-9,500	-12%
North Of Del Amo Boulevard	NB	96,800	97,300	500	1%
	SB	97,300	91,600	-5,700	-6%
North of Route 105	NB	99,400	113,000	13,600	14%
	SB	103,000	77,600	-25,300	-25%
South of SR 60	NB	112,900	104,100	-8,800	-8%
	SB	96,400	89,200	-7,200	-7%
North of Floral Dr	NB	68,400	77,200	8,800	13%
	SB	68,200	67,600	-600	-1%
North of I-10	NB	30,300	18,000	-12,300	-41%
	SB	24,300	23,600	-700	-3%

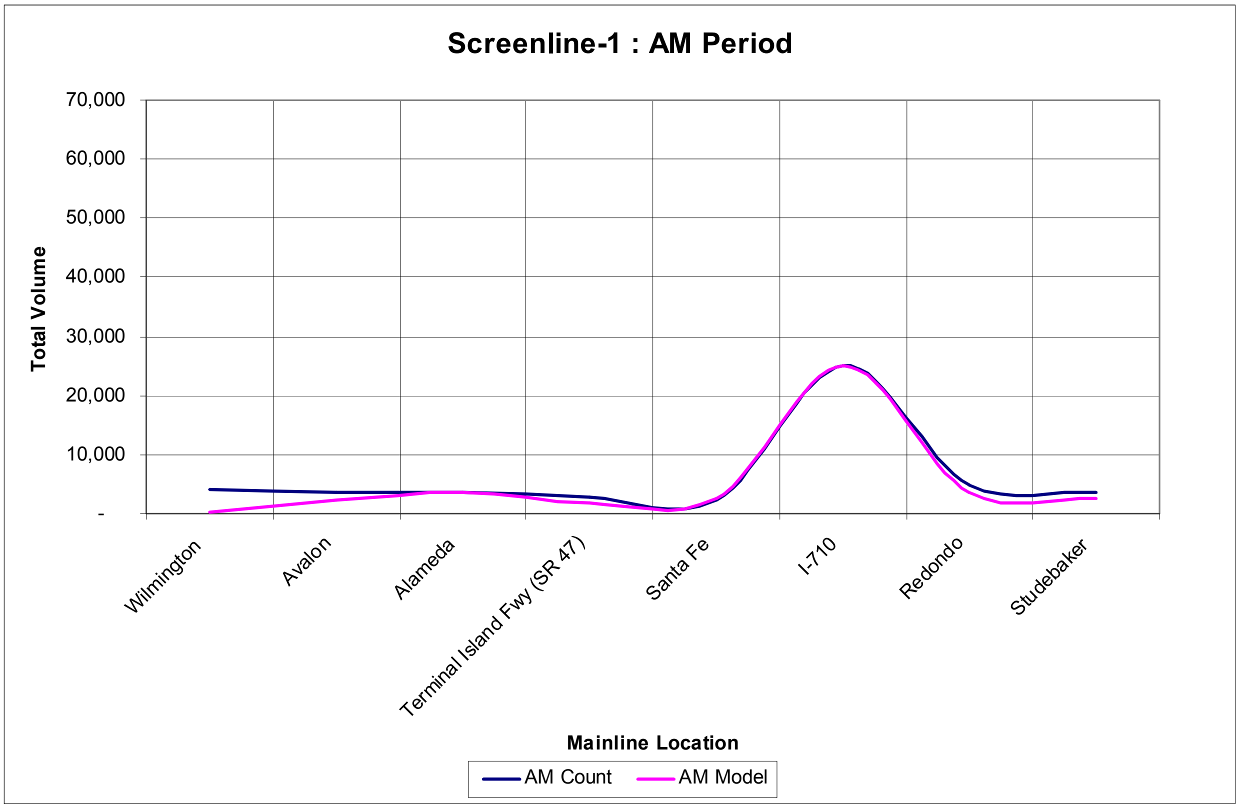
Source: Cambridge Systematics, Inc., 2009.

5.6 SCREENLINE VALIDATION RESULTS

Observed traffic counts on arterials at three screenlines were also used to validate the model. Since the locations where the screenlines crossed the I-710 mainline were slightly offset from the locations where the mainline validation counts were taken, proxies for the I-710 mainline counts at the screenline locations were derived from the 2008 mainline balanced counts derived using the ramp counts and flow conservation. These numbers were developed for the spreadsheet post-processor (the post-processor is discussed further in Section 7.0).

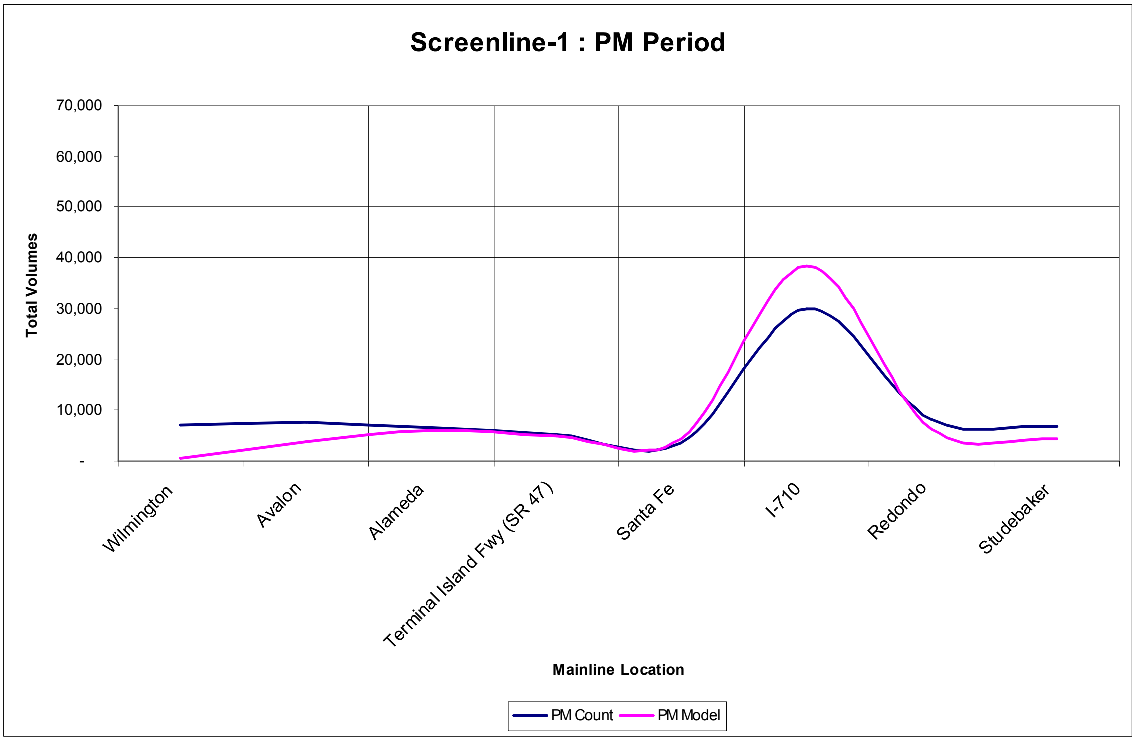
The results of the screenline validation are presented in Figures 6 to 11. Each graph shows the model results compared to the counts for a particular time period and a particular screenline. If the line labeled "counts" is above the line labeled "model" the model is under-predicting. Overall, the model performs better in the AM period. During the PM period, the model over-predicts volumes on the I-710 mainline. This PM period performance is characteristic of a regional model; the model perceives freeways to be more attractive than the arterials. Hence, there are more trips on freeways than on arterials. It is noted that although there is a general disposition for the model to over predict freeway traffic relative to arterials, a purpose of the post-processor methodology that was utilized for the I-710 Corridor Project EIR/EIS is to systematically correct for these differences in order to more closely match observed traffic data. These subsequent adjustments in the post-processor provide the additional accuracy needed for the I-710 mainline, ramps, and key intersections to support the engineering and traffic operations analysis while the raw model results provide critical information at the system level for the entire corridor.

Figure 6. AM Peak-Period Screenline 1 (Pacific Coast Hwy) Model Volumes Versus Counts



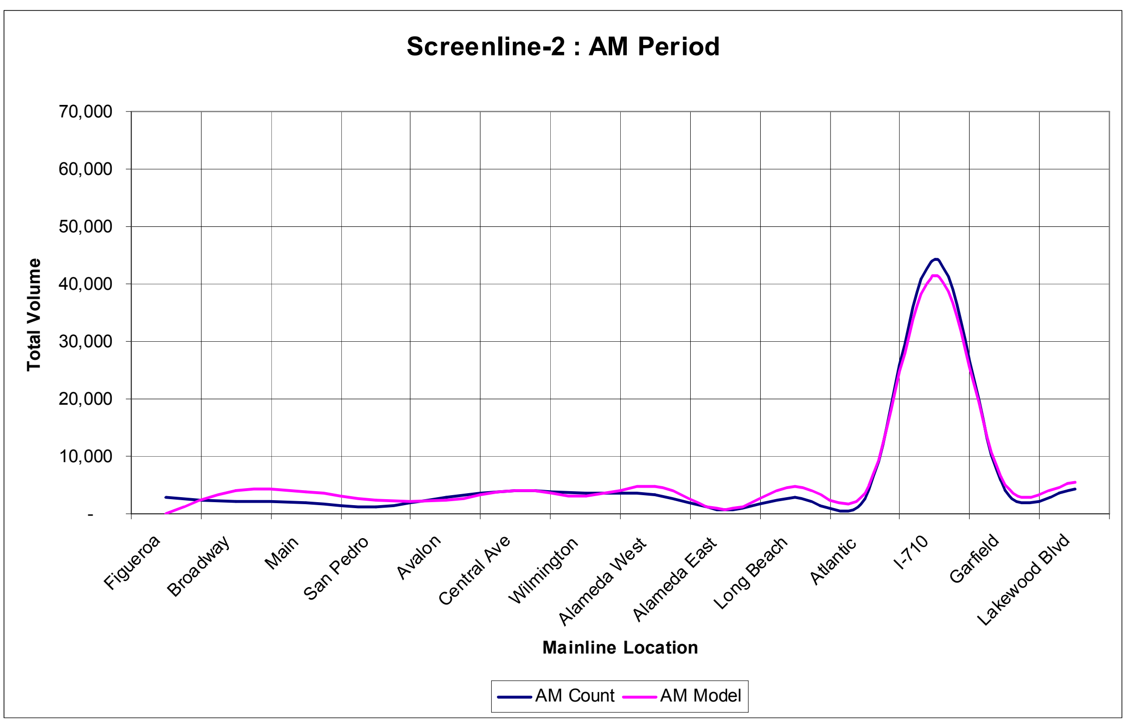
Source: Cambridge Systematics, Inc., 2009.

Figure 7. PM Peak-Period Screenline 1 (PCH) Model Volumes Versus Counts



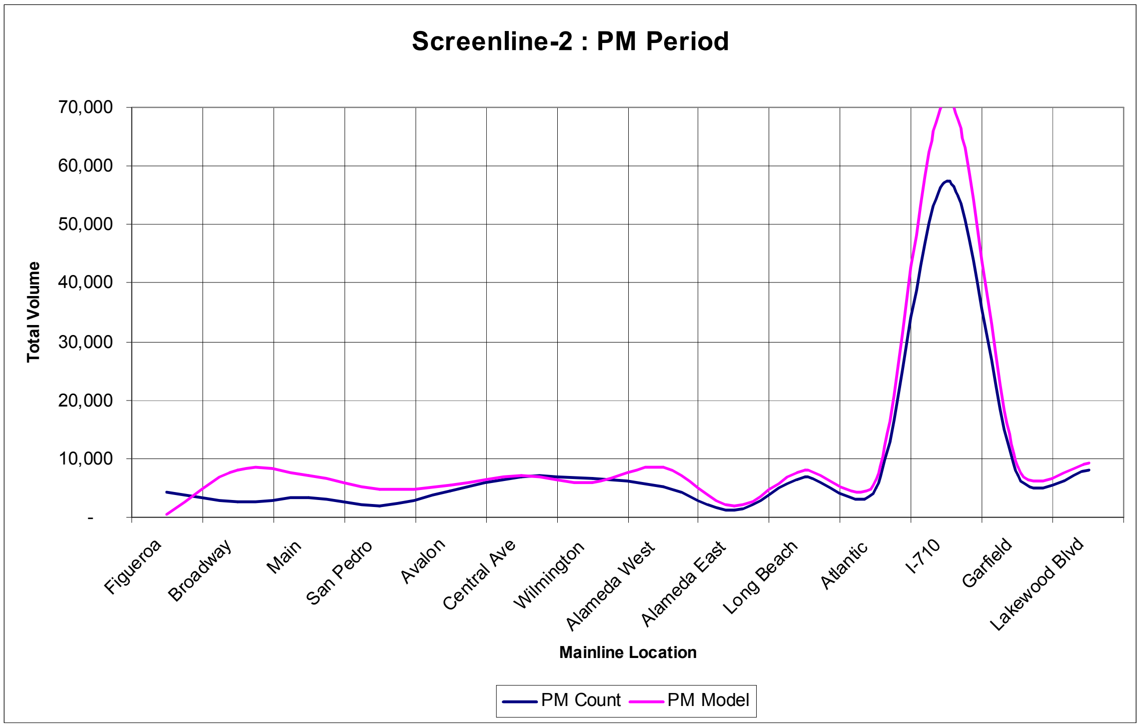
Source: Cambridge Systematics, Inc., 2009.

Figure 8. AM Peak-Period Screenline 2 (Del Amo) Model Volumes Versus Counts



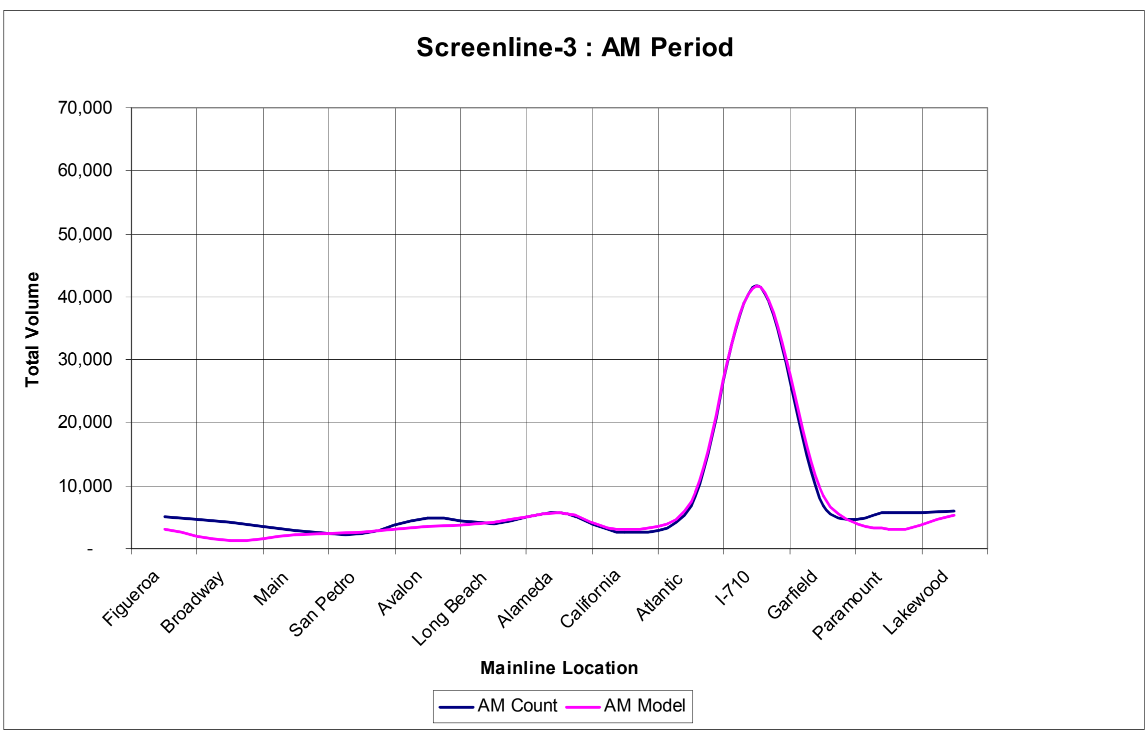
Source: Cambridge Systematics, Inc., 2009.

Figure 9. PM Peak-Period Screenline 2 (Del Amo) Model Volumes Versus Counts



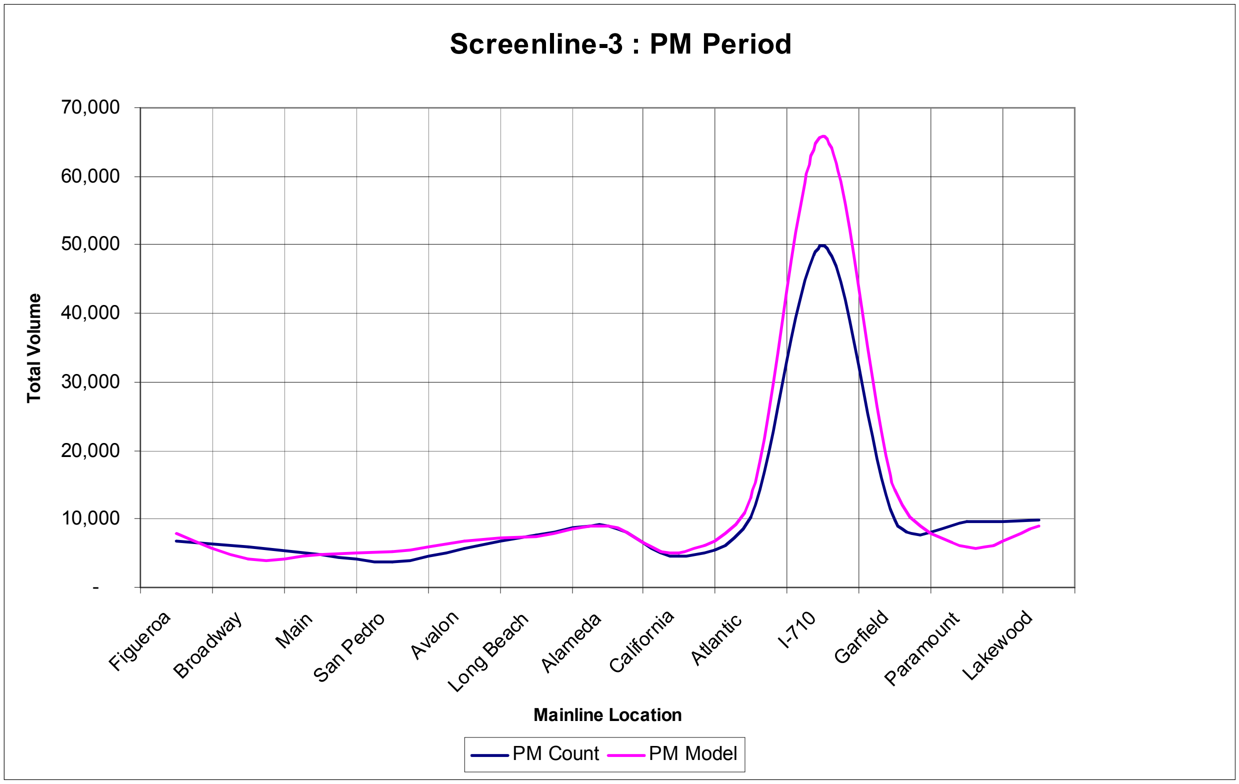
Source: Cambridge Systematics, Inc., 2009.

Figure 10. AM Peak-Period Screenline 3 (Rosecrans) Model Volumes Versus Counts



Source: Cambridge Systematics, Inc., 2009.

Figure 11. PM Peak-Period Screenline 3 (Rosecrans) Model Volumes Versus Counts



Source: Cambridge Systematics, Inc., 2009.

6.0 TRAVEL FORECASTING INPUT DATA ASSUMPTIONS

Prior to running the model, a number of common assumptions and inputs were established for the 2008 base year and 2035 model runs. These are described in the following sections.

Year 2008 is the base year used for the I-710 Traffic Model System. The actual base year for the 2008 SCAG RTP model is 2003, however, SCAG also created a near-term 2008 forecast for their RTP. The inputs and basic network details from this 2008 forecast were used as the starting point for developing the 2008 base year for the I-710 Traffic Model. The forecast horizon year is 2035, and is largely consistent with SCAG's official RTP Baseline. All regional baseline transportation improvements associated with the RTP Baseline forecast are included outside the I-710 study area. Within the study area, no future I-710-related capacity enhancing transportation improvements are assumed. The 2035 socioeconomic data (population, employment) used in the RTP Baseline were used as inputs for the I-710 Traffic Model.

6.1 SOCIOECONOMIC DATA ASSUMPTIONS

SCAG socioeconomic data from the 2008 RTP were used and no changes were made. Regional population is forecast to grow by 27 percent, and study area population is forecast to grow by 11 percent. Employment follows a similar pattern as the region's growth is also 27 percent; whereas, study area employment grows by only 7 percent. Growth is lower in the study area because it is almost completely developed. New growth will be limited to smaller, infill-type developments.

Table 8 summarizes the growth for the entire SCAG model region and for the I-710 study area for both population and employment.

Table 8. Forecasted Growth in Population and Employment

		Year 2008	Year 2035	Percent Change
Population	Regional	18,904,711	24,049,676	**27%**
	Study Area	1,487,180	1,653,167	**11%**
Employment	Regional	8,115,208	10,283,947	**27%**
	Study Area	593,995	636,734	**7%**

Source: Southern California Association of Governments, 2008 Regional Transportation Plan.

6.2 PORT GROWTH ASSUMPTIONS

A number of key assumptions about port cargo growth, mode share, and trip distribution were critical inputs to the traffic forecasting process. The following assumptions have been adopted by the I-710 Project Committee and are summarized below:

- Year 2035 annual cargo container throughput of both ports is forecast to be 43 million TEUs.

- Port trip tables for 2008 used in the SCAG 2008 RTP model were based on extrapolations of trip tables for 2003, 2005, and 2010 that had been provided to SCAG by the ports in 2006. The extrapolated cargo volumes in the SCAG version of the trip tables did not account for the slow growth in cargo volumes experienced between 2007 and 2008 nor did they account for the more rapid increase in on-dock rail at the ports that occurred between 2006 and 2008. Because of these conservative assumptions, the projected 2008 traffic volumes derived from the trip tables are higher than the actual 2008 traffic volumes.. As a result of all this new information, 2008 cargo volumes and cargo mode share (local imports/exports, on-dock, and off-dock intermodal shares) were updated, based on data provided by the ports. This adjustment brought the 2008 and 2035 port truck trip tables into alignment with actual cargo volumes handled by the ports in 2008 and they reflect the most recent observed growth and cargo mode share relationships.

- On-dock intermodal share in 2035 is forecast to be 26 percent, while off-dock share (including empties) is forecast at 14 percent. On-dock railyard capacities are consistent with those reported in the Railroad Goods Movement Study[12] prepared for the I-710 Corridor Project EIR/EIS.

- There is insufficient forecast off-dock railyard capacity to handle all of the combined off-dock international and domestic intermodal cargo in 2035. It is assumed that an amount of international cargo equivalent to that which would be handled at the proposed SCIG intermodal terminal (approximately 2.2 million annual TEUs) will need to be handled at a combination of the existing downtown intermodal rail yards and a new inland intermodal terminal. Approximately 1.9 million TEUS are assumed to be moved via the new inland intermodal terminal.

- Local import and export trips to and from the ports are expected to be distributed in the same way that they are today. This implies substantial growth in port truck trips to/from warehouses and transload facilities in the Gateway Cities. This assumption is consistent with the current port model and the 2008 SCAG RTP model. Given the

[12] Op cit, February 2009.

limited ability of existing warehouses in the Gateway Cities to increase their productivity to accommodate this growth, this trip distribution may be unrealistic. The assumptions about future warehouse locations in the SCAG model is the subject of a more in-depth study in the ongoing SCAG Comprehensive Regional Goods Movement Study. In order to test the traffic impacts of growth in port truck trips to warehouses in the Gateway Cities, a sensitivity analysis was conducted and is described later in this report.

- The 2035 No-Build includes increased port night gate operations and empty container re-use as described previously.

Several of these assumptions are described in more detail below.

Data inputs describing 2035 estimated TEU throughput and mode share for each of the 14 marine terminals at the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) were obtained from the ports. Table 9 summarizes these assumptions, consistent with the overall assumptions approved by the I-710 Corridor Project EIR/EIS Project Committee as described previously.

Table 9. TEU Throughput and Mode Share Assumptions, 2035 QT Model

Port of Los Angeles Terminals	Peak Monthly TEU Throughput	On-Dock (Loaded Imports & Exports)		Off-Dock (Loaded Imports & Exports)		Local Imports & Exports		Empties*	
		%	TEUs	%	TEUs	%	TEUs	%	TEUs
POLA Monthly Throughput and Mode Shares	2,036,900	26%	534,700	8%	157,900	39%	790,300	27%	554,000
POLB Monthly Throughput and Mode Shares	1,890,400	26%	486,700	8%	156,100	39%	733,500	27%	514,200

Source: Port of Long Beach / Port of Los Angeles, 2009.

* Six percent of the empty containers are assumed to be moving via intermodal (on dock and off-dock), resulting in total direct intermodal shares of 40 percent (26 percent loaded on dock + 8 percent loaded off-dock + 6 percent intermodal empties).

The peak monthly TEU throughputs presented in Table 9 are based on the assumption that total annual TEU throughput for the two ports combined would equal approximately 43 million TEUs in 2035 (based on historical averages, peak monthly throughput is assumed to be 9.1 percent of annual throughput). The intermodal (on-dock and off-dock) mode share assumptions are based on capacity analyses conducted by the ports as part of the San Pedro Bay Ports Rail Study Update[13], along with further refinements of these assumptions for the I-710 study. Total direct intermodal mode share for the two ports combined in 2035 is assumed to be 40 percent (26 percent loaded on-dock, 8 percent loaded off-dock, and 6 percent intermodal empties[14]). The empty container management (ECM) assumptions are that 20 percent of the POLA containers are reused (i.e., moved directly from importer to exporter without being returned to the port for storage) and 2 percent of the POLB containers are re-used. By 2035, it is assumed that night gate operations begun under the PierPASS Off-Peak program will be expanded such that each terminal will have 60 percent of cargo moved during the day shift, 20 percent moved during the night shift, and 20 percent moved during the hoot-owl shift. Currently, PierPASS reports that 39 percent of port traffic occurs at night and on weekends, making use of the extra shifts that were added when the Off-Peak program was initiated. Thus, when taking into account the weekend shift, current night operations represent less than 40 percent of total port cargo. This means that by 2035, there will be an increase in the percentage of cargo handled at night on an average weekday. This temporal distribution is also consistent with the assumptions approved by the I-710 Project Committee, and represents an increase in night gate operations above and beyond that which has resulted from the existing PierPASS OffPeak program.

As discussed earlier, the 2035 port truck trip generation model (Quick Trip) is used to develop outputs in terms of total daily (and by hour of day) truck trips originating and terminating at each terminal (by bobtails, chassis, empty containers, and loaded containers). Table 10 presents a summary of the truck trip generation outputs from the 2035 QT model. As seen from Table 10, the two ports combined are estimated to generate a little more than 120,000 daily container truck trips in 2035.

[13] San Pedro Bay Ports Rail Study Update, prepared for POLB and POLA by Parsons, December 2006.

[14] In this context, direct intermodal refers to cargo that is moved by intermodal rail in the same container in which it arrives or departs the port (by sea) as compared to transloaded cargo which is transferred to a different container and then moved by rail. Loaded on-dock containers refer to containers that are loaded and moved by intermodal rail at the marine terminals whereas loaded off-dock containers are loaded containers that are transferred to intermodal yards away from the port. Empty containers in this context refer to empty containers moving by ship and are not accounted for as either on-dock or off-dock movements (although the truck traffic these moves generate when moving to and from off-dock yards is accounted for). Thus, the general assumptions adopted for this study of 30 percent of annual TEU throughput moving via on-dock rail and 10p percent via off-dock rail are consistent with the assumptions embedded in the QT files.

Table 10. Daily Truck Trip Generation Output by Terminal, 2035 Quick Trips Model, Container Trucks Only

	Bobtails		Chassis		Loaded Containers		Empty Containers		Total Port Trucks	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
POLA Total	10,400	9,700	2,000	2,100	5,200	14,900	10,500	1,900	28,100	28,700
POLB Total	11,600	10,900	2,100	2,200	5,100	14,700	12,600	4,100	31,400	31,900
Total	**22,000**	**20,600**	**4,100**	**4,400**	**10,400**	**29,600**	**23,100**	**6,000**	**59,500**	**60,600**

Source: Ports of Los Angeles and Long Beach.

6.3 COMPARISON OF BASE YEAR AND FORECAST YEAR TRAVEL DEMAND INPUTS TO THE I-710 FORECAST MODEL

Based on the assumptions described above, the 2008 base year and 2035 No-Build trip tables were developed and compared. This comparison is described in this section of the report in order to provide a sense of the level of growth in key traffic indicators prior to reporting traffic volume forecasts.

There are forecast to be 11 million more total vehicle trips in the entire SCAG region in 2035 as compared to 2008, with 25 percent to 28 percent growth in the entire SCAG region (depending on the time of day). Within the study area there is 11 percent to 13 percent growth during this same forecast period, or nearly 700,000 more daily total vehicle trips within the study area.

Port truck trips are projected to more than double between 2008 and 2035. Tables 11 through 14 summarize regional and study area trip-making by time period. Study area trips are defined as having one or both trip ends (i.e., origin and/or destination) within the I-710 study area. Ports trips were modified from the SCAG RTP model to reflect updated projections developed for the Ports of Long Beach/Los Angeles Model System.

Table 11. SCAG Region Total Trips

SCAG Region	AM Peak Period	PM Peak Period	Midday Period	Late Night Period	Daily
Year 2008	7,769,900	13,295,400	13,083,500	6,411,500	40,560,300
Year 2035 No-Build	9,735,300	16,895,900	16,763,800	8,197,800	51,592,800
Numeric Growth	1,965,400	3,600,500	3,680,300	1,786,300	11,032,500
Percentage Growth	25%	27%	28%	28%	27%

Source: I-710 EIR/EIS Travel Forecasts, Cambridge Systematics, Inc.

Table 12. Study Area Total Trips

Study Area	AM Peak Period	PM Peak Period	Midday Period	Late Night Period	Daily
Year 2008	1,065,500	1,799,800	1,920,800	886,900	5,673,000
Year 2035 No-Build	1,178,200	2,016,100	2,166,000	1,003,700	6,364,000
Numeric Growth	112,700	216,300	245,200	116,800	691,000
Percentage Growth	11%	12%	13%	13%	12%

Source: I-710 EIR/EIS Travel Forecasts, Cambridge Systematics, Inc.

Table 13. Regional Port Truck Trips (Container and Non-Container Trucks)

SCAG Region	AM Peak Period	PM Peak Period	Midday Period	Late Night Period	Daily
Year 2008	6,300	12,400	27,400	12,600	58,700
Year 2035 No-Build	20,800	21,100	50,500	31,900	124,300
Numeric Growth	14,500	8,700	23,100	19,300	65,600
Percentage Growth	230%	70%	84%	153%	112%

Source: I-710 EIR/EIS Travel Forecasts, Cambridge Systematics, Inc.

Table 14. Study Area Port Truck Trips (Container and Non-Container Trucks)

Study Area	AM Peak Period	PM Peak Period	Midday Period	Late Night Period	Daily
Year 2008	4,300	9,000	18,700	8,600	40,600
Year 2035 No-Build	11,400	12,100	28,200	17,400	69,100
Numeric Growth	7,100	3,100	9,500	8,800	28,500
Percentage Growth	165%	34%	51%	102%	70%

Source: I-710 EIR/EIS Travel Forecasts, Cambridge Systematics, Inc.

6.4 PEAK-PERIOD TO PEAK-HOUR CONVERSION FACTORS

The SCAG model produces traffic forecasts for four time periods. However, many of the traffic analyses required for the I-710 EIR/EIS are based upon the peak-hour traffic volumes. As such, factors were developed to convert the peak-period model forecasts to peak-hour volumes.

Table 15 and Figure 12 present the peak-hour to peak-period factors by time period and the time-of-day traffic volume distribution, respectively. Using the time-of-day distribution curve for a typical average weekday on I-710 and I-5 (south of I-710) shown in Figure 12, factors were developed in order to determine the highest traffic volume hour (or peak hour) for each time period.[15] The total volumes that were produced by the model for each time period were divided

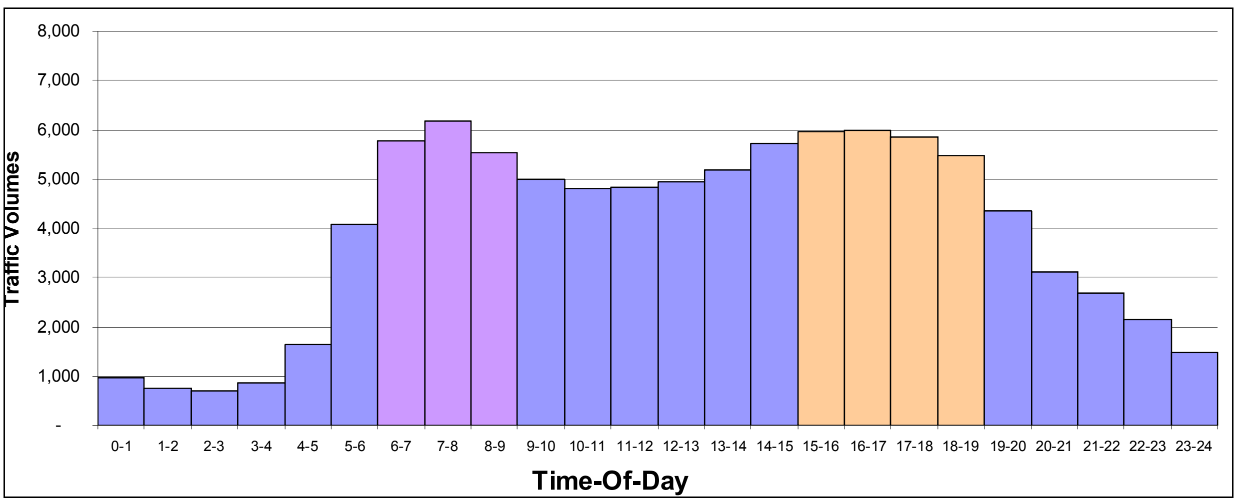
[15] Concurrent with the I-710 Corridor Project EIR/EIS, an EIR/EIS was being conducted for I-5 covering the area where the two freeways intersect. The same basic modeling system is being used for both projects in order to ensure consistency. In the I-710 project, peak hour analysis is being conducted for three time periods (AM, PM, and Midday); whereas for the I-5 project, peak-hour analysis is only being conducted for the AM and PM periods. Therefore, the peak hour conversion factors for the AM and PM periods were developed using data from both I-710 and I-5 combined whereas only I-710 data were used for the Midday.

by the peak-hour factor in order to estimate and thus report volumes for the peak hour of each time period. These data were arrived from summarizing recent traffic counts collected for both the I-710 and nearby I-5 corridors.

Table 15. Peak-Hour to Peak-Period Factors

Peak Hour	Peak-Period Factor	Length of Period
AM	2.88	3 hours (6:00 a.m.-9:00 a.m.)
Midday	3.97	6 hours (9:00 a.m.-3:00 p.m.)
PM	5.33	4 hours (3:00 p.m.-7:00 p.m.)

Figure 12. Time-of-Day Traffic Volume Distribution for I-710 and I-5 Corridors



Source: PeMS average weekday counts (September and October 2007) at selected I-710 and I-5 locations. 0600-0900 is AM peak period; 0900 to 1500 is midday period; 1500-1900 is PM peak period.

7.0 POST-PROCESSING OF MODEL RESULTS

In order to go beyond what can reasonably be achieved in terms of accuracy and detail building from a regional travel demand model that provides traffic estimates on a subarea basis, it is typically necessary to make further adjustments to the "raw" model results to more closely replicate travel conditions on specific facilities within the I-710 study area – in this case travel on the I-710 freeway and at specific arterial intersections. These adjustments are made to provide a greater level of consistency with available 2008 base year counts. These adjustments can then be applied to forecast results to ensure that the forecasts are consistent with the base year. The adjustment procedures are referred to as post processing. When developing a post-processor methodology it is important that it be based on a consistent set of adjustment rules, that it rely on actual data for existing conditions, and that it be clear so that the procedures can be applied on a uniform basis in a manner that produces consistent and reliable results. This section of the traffic forecasting report describes the post-processor methodologies developed for the I-710 Corridor Project EIR/EIS.

Spreadsheet post processors were developed at three levels:

1. I-710 Mainline and Ramps;
2. Intersection Turn Movements; and
3. Intersecting Freeways.

7.1 MAINLINE AND RAMP POST-PROCESSOR METHODOLOGY

The objective of the 2008 base year mainline and ramp post-processor was to adjust the traffic volumes produced by the model to match ground counts as closely as possible. It was not possible to match the counts for each ramp and mainline location precisely because the different counts were not all taken on the same day and the post-processed traffic volumes needed to be balanced throughout the corridor (i.e., what remains on the mainline after an interchange has to equal what was on the mainline before the interchange plus what got on at the interchange and minus what got off).

The post-processing was conducted for total vehicle volumes (not vehicle classes) by direction for the AM, PM, and Mid-Day periods. Once the balanced baseline volumes were developed, the model vehicle classification splits (between autos, port trucks and non-port trucks) were applied to the total volumes to get full vehicle class information. Please refer to Appendix D for details of the mainline and ramp post-processor.

The basic methodology applied to the post-processor for the forecast year (2035) was straightforward – the change in model volumes between the 2008 base year and 2035 year No-Build were added to 2008 traffic counts to create the post-processed 2035 No-Build. Some additional post-processing was also required for conservation of traffic flow between ramps and mainline segments.

The application of the post-processor was similar for the project alternatives. Here, the change in model volumes between build and No-Build alternatives were added to the post-processed No-Build volumes – with appropriate changes to maintain conservation of flow.

Since identical post-processing rules were applied for all alternatives and all time periods, after conservation of flow rules were applied for each vehicle class, there were some occasional instances where illogical results were obtained from the post-processor. These were generally rare instances in which the traffic volumes for a particular vehicle class and a particular time period might produce negative volumes at an individual freeway segment or where growth rates in traffic on a particular ramp were inconsistent with the relative growth in the model. In these cases, alternative rules were developed. Examples of these alternative rules would be to apply the same percentage of a particular vehicle class using a particular ramp to the post processed results to get a post-processed result that more closely replicated model patterns.

7.2 INTERSECTION POST-PROCESSOR

Intersection approach and departure traffic volumes were used from the model to develop peak-hour turning movement volumes for traffic analysis purposes. The turning movements produced by the raw model were not used directly for the analyses. In post-processing the turn movement volumes, growth from the model was applied to each turning movement from the observed ground counts using the methodology provided in the NCHRP 255 to ensure reasonableness and validity. The intersection turning movement post-processing was conducted for three peak periods: AM, PM, and Midday. Below is an example of the intersection turning movement post-processing performed using the approach and departure volumes and the WTurns32 software to develop AM peak-hour volumes for use in the analysis. The post-processing of turning movements for the intersections followed the steps detailed below:

1. Obtain the 2008 and 2035 SCAG model outputs by link;
2. Determine the appropriate projection method (difference and/or growth percentage) for the growth by link;
3. Using the 2008 balanced volumes and the growth, project the traffic to create the 2035 link volumes; and
4. Using a turn balancing program (such as WTurns32) with the 2008 volumes and the 2035 link volumes, create 2035 intersection turn movement volumes.

Rules were applied to ensure consistent treatment of growth of individual volumes based on the results of the raw model. If the model forecasted a positive growth then the model forecast growth was applied directly in the form of the approach/departure volumes. If the model produced a negative growth, then it was assumed that the specific turning movements would grow by 5 percent in year 2035 (i.e., negative growth was not allowed unless there was a redistribution of traffic due to improvements to facilities feeding the traffic flow in question). If the model produced zero growth in turning movements in the future year and there were some existing movements in the observed ground counts then a generic growth rate of 11 percent, 12 percent, and 12 percent was applied for AM, MD, and PM peak hours. Engineering judgment was used in cases where new facilities were added or removed from the transportation network based on the model trip assignment.

7.3 Intersecting Freeways Post-Processor

In order to ensure consistency between the I-710 mainline and ramp volumes and all freeways intersecting with I-710, a post-processor was developed for the intersecting freeways. Raw model results on the intersecting freeways (I-405, SR 91, I-105, I-5, and SR 60) were post-processed within an envelope extending one mile in each direction (east and west) from I-710. The Intersecting Freeway post-processor was based on total vehicle volumes.

The starting point for the Intersecting Freeway post-processor was to obtain consistent results for the 2008 base year. Post-processed ramp volumes from the I-710 Mainline and Ramp post processor were used in the case of ramps to the intersecting freeways that connect to I-710. For other ramps that connect to the intersecting freeways within the one mile envelope (but that do not connect to I-710), raw model results were used. Once this new set of ramp volumes was established, raw model volumes on each freeway at the edge of the one mile envelope were used as a starting point and the post-processed ramp volumes were used in a flow conservation calculation to adjust the mainline volumes within the one mile envelope on each intersecting freeway. This established the 2008 base year intersecting freeway volumes.

The 2035 Intersecting Freeway post-processor approach was similar to the approach used in the I-710 Mainline and Ramp post-processor. That is, the raw model output for 2035 No-Build conditions was compared with the raw model 2008 mainline and ramp volumes for each of the intersecting freeways and the raw model growth was added to the 2008 post-processed mainline and ramp volumes. As in the I-710 post-processor, the ramp and mainline volumes were balanced through a conservation of flow procedure. For the build alternatives, the same basic approach was used except that the change in ramp and mainline volumes on the intersecting freeways were based on the difference between 2035 raw model volumes for the build alternatives as compared to the 2035 No-Build. Again, the ramp and mainline volumes were balanced based on conservation of flow.

All post-processing was accomplished separately by direction and by time period.

7.4 NONPORT TRUCKS – RAILROAD INTERMODAL FACILITIES

Another important aspect of the post-processing methodology was to examine the forecasts of the truck volumes on the I-710 freeway ramps that serve the railroad intermodal facilities located in the northern portion of the I-710 Corridor, just southeast of the I-5/I-710 interchange.

While the travel patterns of the port trucks that transport containers between the San Pedro Bay ports and these two intermodal facilities are relatively well understood through the Port Model component of the I-710 Traffic Forecasting System, the routes that the trucks carrying domestic cargo use to access the intermodal yards are less well known. In order to fill in this information gap on domestic truck patterns associated with the railroad intermodal facilities, a short-form survey of the nonport truck drivers was conducted at the Union Pacific (UP) East Los Angeles Intermodal Terminal and the BNSF Hobart/Commerce Intermodal Complex in early February 2009. The results of this survey are detailed in the *I-710 Corridor Project EIR/EIS Railroad Intermodal Non-Port Truck Driver Survey Summary and Findings, Updated July 24, 2009*.

Through the post-processing procedures, a series of reasonability checks were performed to test to see how well the model replicated nonport truck patterns into and out of the two railroad intermodal facilities as measured against the survey results. According to the survey, the majority of these domestic truck drivers on I-710 utilize ramps at the I-710/Washington Boulevard interchange. The next most utilized interchange is the I-710/Atlantic-Bandini interchange. While forecast volumes of nonport trucks entering/exiting the rail yards to and from the south along the I-710 Corridor exhibited patterns that were consistent with the survey results, it was determined that the model was under-representing the intermodal, nonport trucks entering/exiting the I-710 Corridor to and from areas north and east of the intermodal yards (e.g., Inland Empire). In order to correct for this, the nonport truck volumes at the Washington Boulevard and the Atlantic-Bandini Boulevard ramps were adjusted upwards, by time period, as needed to meet the minimal volume thresholds for each individual ramp based on travel patterns derived from the survey, and accounting for those nonport trucks traveling to other, truck-intensive land uses in the general area.

This post-processing step was undertaken for the 2008 baseline traffic condition, the 2035 No-Build traffic condition, and for each of the build alternatives under study. As part of this process, it was important to keep track of I-710 ramp choices for both inbound and outbound trucks by freeway direction on I-710 (i.e., northbound versus southbound I-710), as well as differences in ramp choices between the UP East LA intermodal facility and the BNSF Hobart intermodal facility. This step was particularly important in light of the design concepts under study for the build alternatives – especially Alternatives 6A/6B, which involve the placement of ramps that separate truck traffic from general purpose traffic and that lead directly to the main gates of the two intermodal facilities.

After making post-processing adjustments to the raw model output that accounted for the under-representation of nonport truck trips accessing the intermodal yards from the north and east, additional reasonability checks were performed and conservation of flow procedures were again applied to ensure that traffic flows were properly balanced among the arterials, the ramps, and along the I-710 mainlines.

8.0 DESCRIPTION OF THE REDUCED SET OF ALTERNATIVES

As a result of the alternatives screening process, the following alternatives are included in the Reduced Set of Alternatives being analyzed in the I-710 Corridor Project EIR/EIS. The Reduced Set of Alternatives is described as follows. **Appendix E** provides a more detailed description of each of these alternatives.

Alternative 1 No-Build. The No-Build Alternative consists of those transportation projects that are already programmed and/or committed to be constructed by or before the study's planning horizon year of 2035. Therefore, Alternative 1 represents future travel conditions in the I-710 Corridor and is the baseline against which the I-710 Corridor Project alternatives are assessed. It is also included in each of the build alternatives. The projects included in this alternative are based on SCAG's 2008 Regional Transportation Plan (RTP), as well as the 2008 Regional Transportation Improvement Program (RTIP) project list. These No-Build projects include the following improvements over what is on the ground today:

- Added Lanes to I-5 between the Orange County Line and I-605;
- SR 47 Improvement Project;
- New Six-Lane Gerald Desmond Bridge; and
- Traffic Signal Coordination on Key Arterials in the I-710 Corridor Study Area.

Alternative 5A: I-710 Freeway Widening and Modernization. This alternative proposes to widen the freeway to 10 general purpose lanes from Ocean Boulevard in Long Beach to SR-60 in East Los Angeles, along with modernizing and improving all of the freeway and arterial interchanges along this stretch. It also includes a new I-710 interchange at Slauson Avenue. The number of general purpose lanes will be evaluated and modified, if necessary, for each segment of I-710 based upon detailed traffic operations analyses utilizing the traffic forecasting described in this report.

Alternative 5A also includes the projects included in Alternative 1 No-Build, along with improvements included in initial Alternative 2 Transportation Systems Management (TSM)/ Transportation Demand Management (TDM)/Transit, Alternative 3 Goods Movement Enhancement by Rail and/or Advanced Technology and Alternative 4 Arterials and Freeway Congestion Relief.

Alternative 6A: I-710 Freight Corridor for All Trucks. This alternative proposes to widen the freeway to 10 general purpose lanes from Ocean Boulevard in Long Beach to SR-60 in East Los Angeles, along with modernizing and improving all of the freeway and arterial interchanges along this stretch. It also includes a new I-710 interchange at Slauson Avenue. In addition, it includes a Freight Corridor adjacent to I-710 consisting of four separate lanes for use by only heavy-duty trucks powered by diesel or other systems. These truck-only lanes have ingress and egress ramps to and from the I-710 general purpose lanes at specified locations along the freeway between Ocean Boulevard in Long Beach and Washington Boulevard in Commerce/Vernon. (Refer to Figure 13).

Alternative 6A also includes the projects included in Alternative 1 No-Build, along with improvements included in initial Alternative 2 Transportation Systems Management (TSM)/Transportation Demand Management (TDM)/Transit, Alternative 3 Goods Movement Enhancement by Rail and/or Advanced Technology and Alternative 4 Arterials and Freeway Congestion Relief.

Alternative 6B: I-710 Freight Corridor for Zero Emission Trucks Only. This alternative proposes to widen the freeway to 10 general purpose lanes from Ocean Boulevard in Long Beach to SR-60 in East Los Angeles, along with modernizing and improving all of the freeway and arterial interchanges along this stretch. It also includes a new I-710 interchange at Slauson Avenue. In addition, it includes a Freight Corridor adjacent to I-710 consisting of four separate lanes for use by zero tailpipe emission heavy-duty trucks only. These truck lanes have ingress and egress ramps to and from the I-710 general purpose lanes at specified locations along the freeway between Ocean Boulevard in Long Beach and Washington Boulevard in Commerce/Vernon. (Refer to Figure 13).

This zero tailpipe emission truck technology would include, but not be limited to, battery powered trucks as well as trucks powered by overhead electrical lines, linear induction motor or linear synchronous motor systems (or other concepts), or future zero emission technologies to be developed or designed as part of the Freight Movement Corridor. The design of the Freight Corridor will also assume possible future conversion, or initial construction, as feasible, (which may require additional environmental analysis and approval) of a fixed track guideway family of alternative technologies (e.g., Maglev).

Alternative 6B also includes the projects included in Alternative 1 No-Build, along with improvements included in initial Alternative 2 Transportation Systems Management (TSM)/ Transportation Demand Management (TDM)/Transit, Alternative 3 Goods Movement Enhancement by Rail and/or Advanced Technology and Alternative 4 Arterials and Freeway Congestion Relief.

Neither alternative 6A nor 6B included any Freight Corridor connectors between I-710 and SR 91. (Subsequent to this report, a forecast has been developed which included 4 connectors between the Freight Movement Corridor and SR-91). The results of this forecast are presented in the *Draft Freeway Traffic Operations Analysis Report*.

8.1 TREATMENT OF THE TSM/TDM/TRANSIT IMPROVEMENTS IN THE BUILD ALTERNATIVES TRAFFIC FORECASTING

Study area peak-period auto trips were reduced by 2.8 percent to account for the Transit improvements included in the build alternatives.[16] The peak-period trip tables were modified post-mode choice and pre-traffic assignment. Off-peak periods were assumed to not be affected.

I-710 mainline capacity was increased by 6 percent to account for ITS improvements to I-710. This capacity increase was assumed for all time periods. Capacities were also increased by 6 percent for arterials with 4 or more lanes in the study area to account for arterial ITS improvements.

Roadway capacity was increased by another 17 percent for five parallel arterials in the study area to account for the peak-period parking bans on these facilities included in the build alternatives. This increased capacity was over and beyond that assumed for study area ITS improvements. This improvement was based on information observed from other studies. See Figure 14.

[16] The basis for TSM/TDM/Transit adjustments to the travel demand model are explained in more detail in Final Report, Technical Memorandum – Multimodal Review, WBS Task ID: 165.10.05-010, March 4, 2009.

Figure 13. Conceptual I-710 Freight Corridor (FC) Access/Egress Points

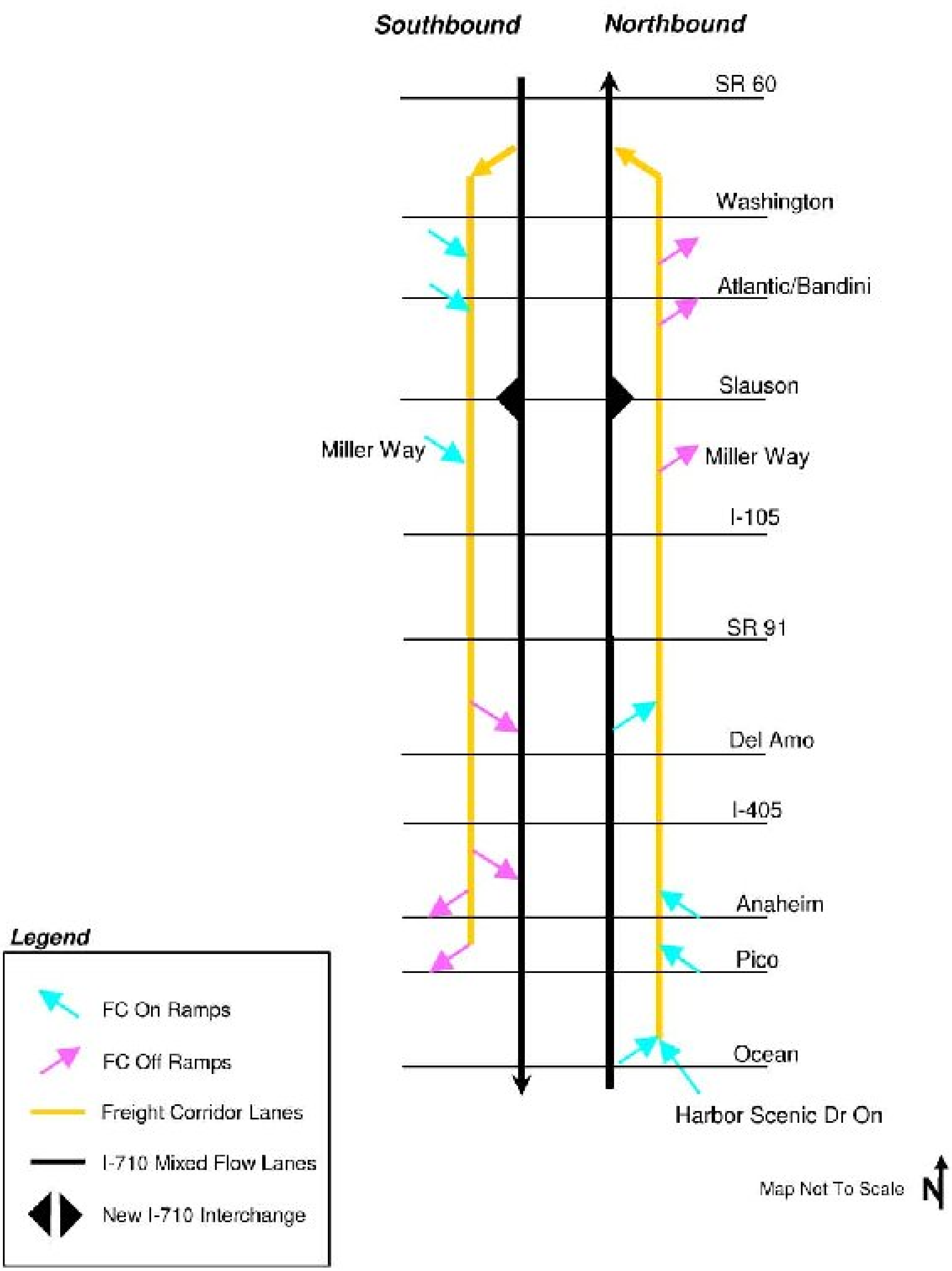
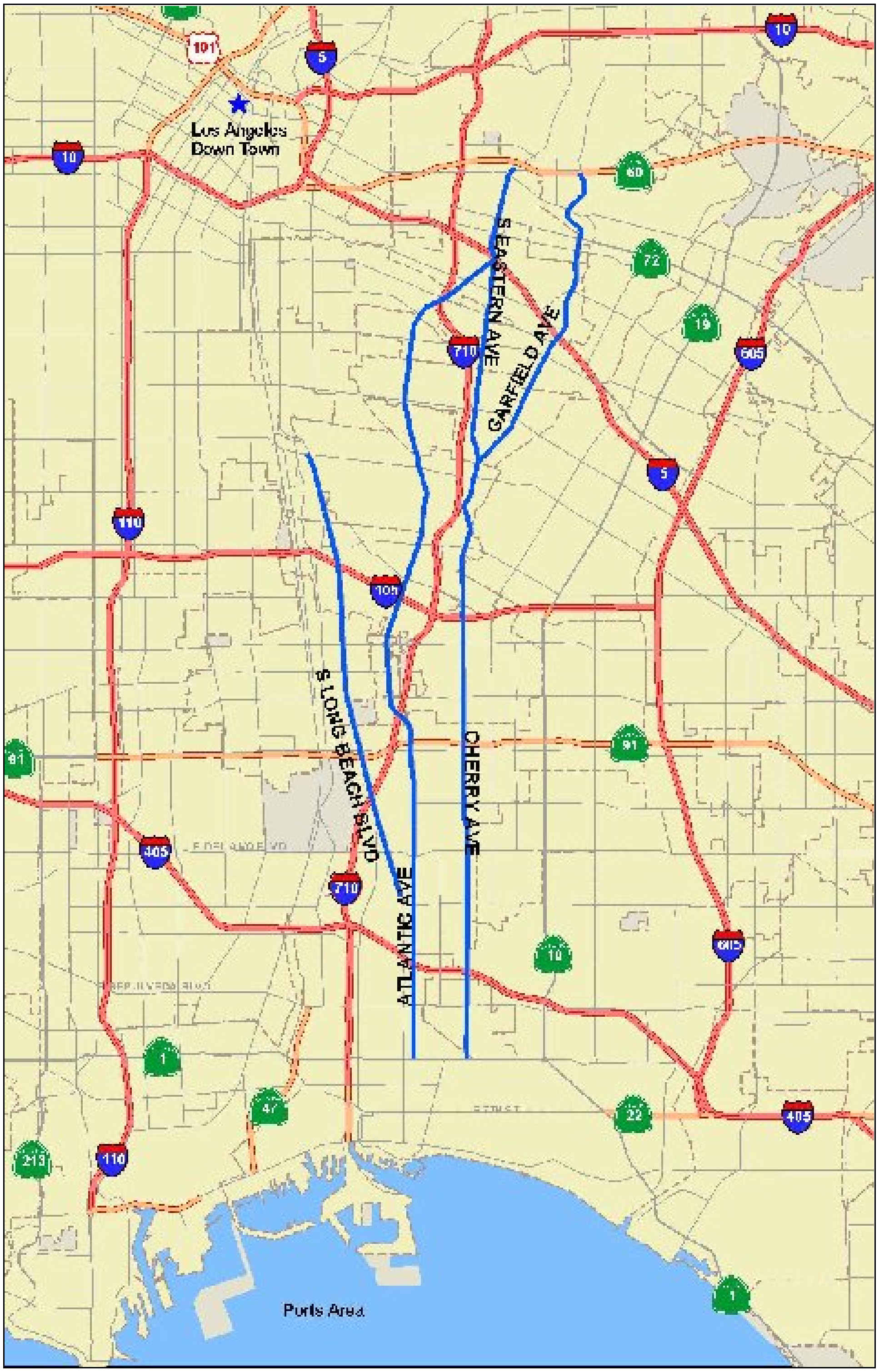


Figure 14. Peak-Period Arterial Parking Restrictions



9.0 2035 TRAFFIC FORECASTS

Traffic forecasts (2035) for the I-710 Corridor Project EIR/EIS provide key inputs to a number of measures of effectiveness for each of the project alternatives compared to No-Build traffic conditions. Measures included in this section are vehicle miles of travel, vehicular volumes on I-710 (expressed as passenger car-equivalents), truck volumes, and screenline volumes. In addition, this section provides auto, port truck, and nonport truck volumes on freeways in the study area, as well as total average daily traffic (ADT) on major arterials. These measures, whether considered individually or together, express the effectiveness of each project alternative in terms of increasing mobility for autos and trucks in the corridor, while the traffic volume summaries throughout the study area provide an indication of the system-level impacts of the alternatives. Multiple measures are selected, as no single measure effectively illustrates overall project alternative performance.

Table 16 shows vehicle miles of travel (VMT) for the 2008 and 2035 No-Build forecasts in the study area. Although total freeway VMT increases by only 9 percent to 2035, port truck VMT is forecast to increase by 155 percent. Total regional arterial VMT is projected to increase by 12 percent, somewhat higher than freeway VMT. It should be noted that vehicle volumes for all vehicle classes and all facility types show increases reflecting congested conditions in the corridor.

Table 16. Study Area Daily VMT (in Millions of Miles)

	Auto VMT	Port Trucks VMT	Nonport Trucks VMT	Total
Freeways				
Year 2008	38.5 M	0.6 M	3.0 M	**42.0 M**
2035 No-Build	40.9 M	1.4 M	3.6 M	**46.0 M**
Numeric Difference	+2.4 M	+0.8 M	+0.6 M	**+4.0 M**
Percent Difference	+6%	+155%	+22%	**+9%**
Arterials/Others				
Year 2008	32.5 M	0.3 M	1.3 M	**34.0 M**
2035 No-Build	35.9 M	0.7 M	1.5 M	**38.1 M**
Numeric Difference	+3.4 M	+0.4 M	+0.2 M	**+4.1 M**
Percent Difference	+11%	+131%	+14%	**+12%**

Source: Cambridge Systematics, Inc., 2009.
VMT = Average weekday daily vehicle miles of travel. Numerical and percent changes based on actual, not rounded values.

M = Million.

Alternative 5A shows an increase in VMT of 1 percent on the freeways compared to No-Build, and a decrease of 1 percent on arterials. Overall, Study Area VMT increases slightly because the added I-710 capacity draws vehicles from outside the corridor into the study area. The reduction in arterial traffic volumes indicates that the increased freeway capacity does provide some relief to traffic on the arterials. Alternative 6A/6B shows more pronounced growth in freeway VMT with respect to Alternative 5A. This result is logical as Alternative 6A/6B includes the freight corridor facility. See Tables 17 and 18.

Table 17. Study Area Daily VMT Comparison, Alternative 5A versus 2035 No-Build

	Auto VMT	Port Trucks VMT	Nonport Trucks VMT	Total
Freeways				
2035 No-Build	40.9 M	1.4 M	3.6 M	**46.0 M**
2035 Alternative 5A	41.5 M	1.5 M	3.6 M	**46.6 M**
Numeric Difference	+0.6 M	+0.1 M	0.0 M	**+0.6 M**
Percent Difference	+1%	+2%	+1%	**+1%**
Arterials/Others				
2035 No-Build	35.9 M	0.7 M	1.5 M	**38.1 M**
2035 Alternative 5A	35.6 M	0.7 M	1.4 M	**37.7 M**
Numeric Difference	-0.3 M	0.0 M	-0.1 M	**-0.4 M**
Percent Difference	-1%	-2%	0%	**-1%**

Source: Cambridge Systematics, Inc., 2009.
VMT = Average weekday daily vehicle miles of travel. Numerical and percent changes based on actual, not rounded values.
M = Million.

Table 18. Study Area Daily VMT Comparison, Alternative 6A/6B versus 2035 No-Build

	Auto VMT	Port Trucks VMT	Nonport Trucks VMT	Total
Freeways				
2035 No-Build	40.9 M	1.4 M	3.6 M	**46.0 M**
2035 Alternative 6A/6B	41.9 M	1.5 M	3.7 M	**47.1 M**
Numeric Difference	+1.0 M	+0.1 M	+0.1 M	**+1.1 M**
Percent Difference	+2%	+8%	+2%	**+2%**
Arterials/Others				
2035 No-Build	35.9 M	0.7 M	1.5 M	**38.1 M**
2035 Alternative 5A	35.5 M	0.6 M	1.4 M	**37.6 M**
Numeric Difference	-0.4 M	-0.1 M	-0.1 M	**-0.5 M**
Percent Difference	-1%	-5%	0%	**-1%**

Source: Cambridge Systematics, Inc., 2009.
VMT = Average weekday daily vehicle miles of travel. Numerical and percent changes based on actual, not rounded values.
M = Million.

9.1 SCREENLINE SUMMARIES

Screenline traffic volume results were plotted to graphically display data by time period (AM, MD, and PM) for all four alternatives, namely: 2008 base year; 2035 No-Build, 2035 – general purpose lanes only (5A); and 2035 – general purpose plus freight corridor lanes (6A/6B). Figure 15 shows the screenline locations used in this study. As a reminder, the overall I-710 study area, as reported in the travel demand forecast results, is relatively broad in that both I-110 and I-605 are included in the screenline analysis in addition to I-710 in order to capture how traffic redistributes itself across this entire area in response to the proposed alternatives.

In general, vehicle volumes on Screenline 4 are comparatively higher for both freeways and arterials for all alternatives and time periods. Additionally, the results depict increased freeway volumes in the midday time period for Screenlines 1, 2, and 4 compared to AM and PM for all alternatives (with AM freeway volumes being the lowest). See Figures 16 through 19.

2035 No-Build volumes are higher than base year 2008 volumes on both freeways and arterials as expected. In addition, arterial volumes are higher under No-Build than for all other alternatives – across all time periods. This indicates that in the absence of increased capacity on the freeways by 2035, more vehicles will divert to arterials to avoid the possible congestion encountered on freeways.

Figure 15. Screenline Map

Figure 16. Screenline Volume Comparisons Across Alternatives, AM Peak Period

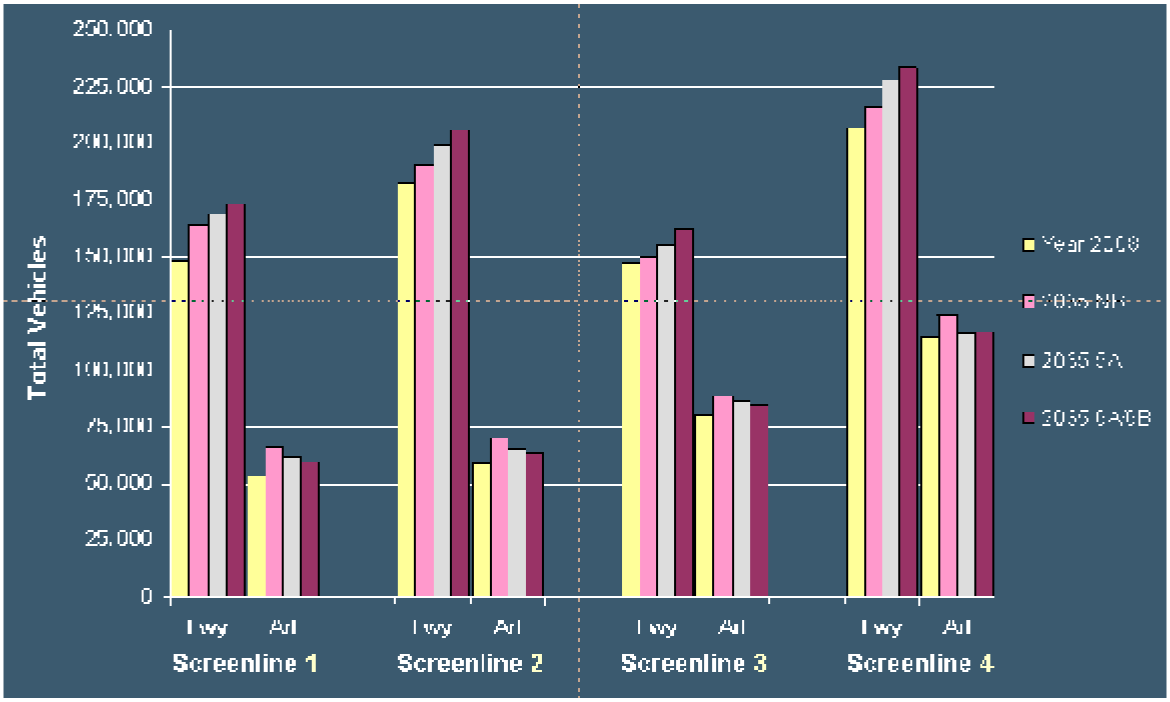


Figure 17. Screenline Volume Comparisons Across Alternatives, PM Peak Period

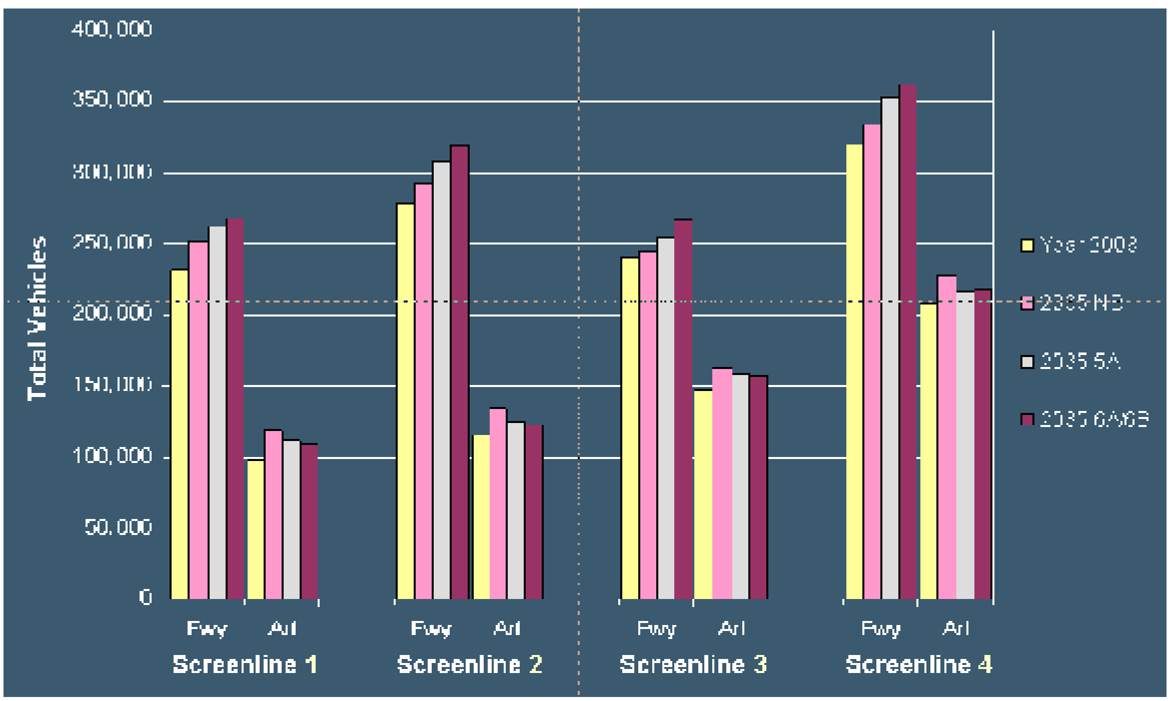


Figure 18. Screenline Volume Comparisons Across Alternatives, Midday Period

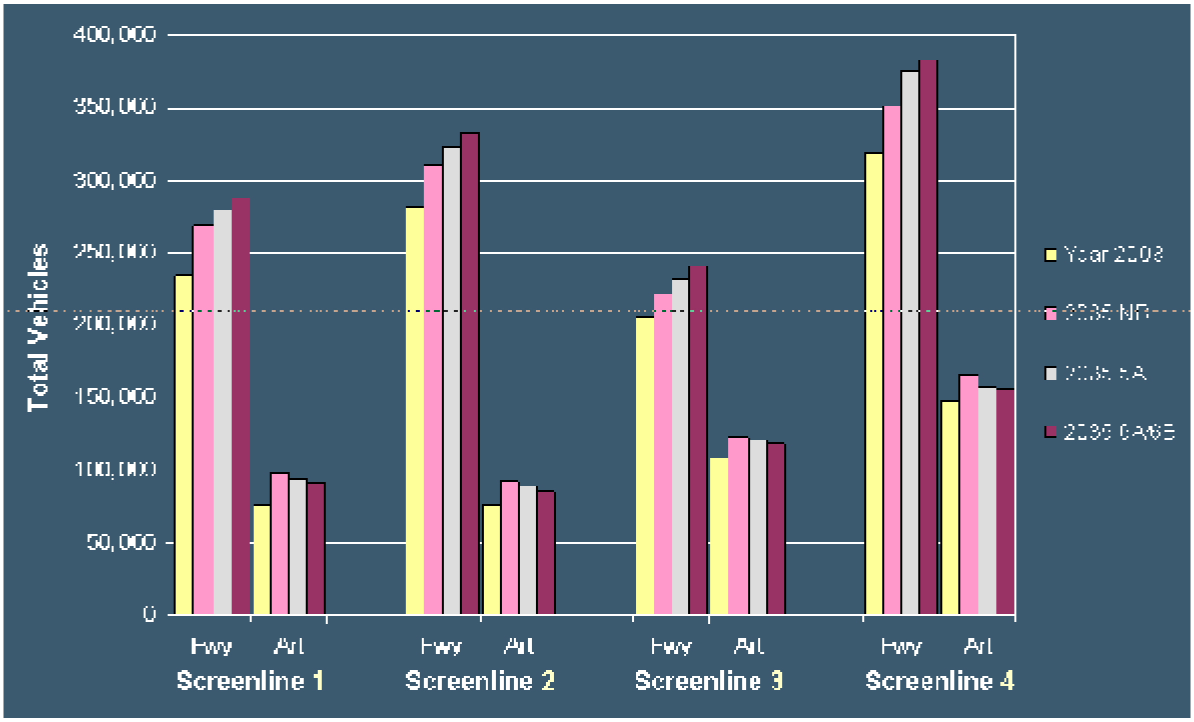
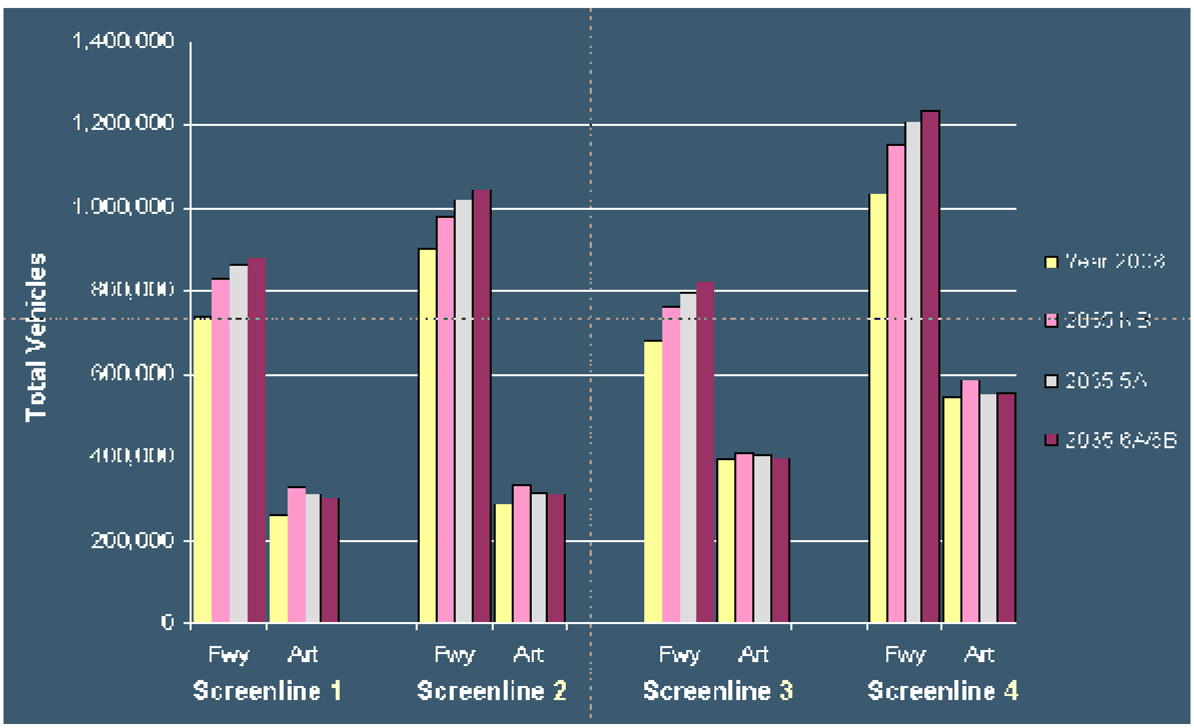


Figure 19. Screenline Volume Comparisons Across Alternatives, Daily



2035 Alternative 5A has increased freeway volumes (including the I-605, I-110, and sections of I-405, I-105, and I-5, as well as the I-710) compared to 2008 and 2035 No-Build alternatives. Arterial volumes are higher than 2008 but lower than the 2035 No-Build alternative for all time periods and all screenlines. The volume increase signifies that increasing highway capacity on I-710 will provide an incentive for more vehicles to use freeways compared to arterials in the study area.

2035 Alternative 6A/6B has the highest freeway volumes compared to all other alternatives – consistent with the additional freeway capacity in the I-710 Corridor represented by the added general purpose lanes and the new freight corridor lanes in this alternative. Arterial volumes are higher than base year 2008, but lower than 2035 No-Build and 2035 GP Lanes (5A) numbers. This indicates that fewer vehicles will divert to arterials as compared to the other two alternatives since increased highway capacity will accommodate more vehicles on freeways. Traffic is redistributing itself in response to capacity improvements, as well as from congestion relief and arterial improvements. On the whole, the arterials in the study area show reduced volumes and increased speeds as compared to other alternatives.

In addition to the analysis contained in this report, the Draft Freeway Traffic Operations Report WBS:160.10.35 provides more detailed level of service (LOS) analysis for the I-710. It should be noted, however, that those additional analyses show that even though more traffic is attracted to the freeways and the freight corridor, travel times and mobility improve throughout the study area as a result of increased freeway capacity and reduced arterial traffic relative to the No-Build conditions.

Figure 20 provides weekday daily passenger-car equivalents (PCEs) for all I-710 locations for each project alternative. Figures 20-26 display north bound traffic on I-710 and hence the charts should be read from right to left. Overall, the results are much as one would expect. Vehicle volumes are higher for all alternatives in 2035 as compared to 2008 base year volumes. Alternative 6A/6B generally shows the highest overall volumes, and No-Build (Alternative 1) shows the lowest of the three 2035 alternatives. This is due to the substantial increase in I-710 capacity in Alternative 6A/6B as compared to the No-Build alternative. The increased freeway capacity draws traffic from arterials as well as some additional through traffic that is drawn into the study area as a result of slightly reduced congestion. Northbound volumes only are shown here as illustrative of general trends observed in both directions. The full range of data for all time periods, locations, and directions – both in graphical and tabular forms - are available on request.

In the cases where data are provided for a mix of trucks and autos, the data are displayed in terms of PCEs. This takes into account the effects on congestion of each type of vehicle in an equivalent manner. However, in cases where the data are provided for trucks only (Figures 21, 23, and 24), then a more appropriate unit of analysis is trucks (and not PCEs).

There are some instances at the south end of the corridor, where Alternatives 5A and 6A/6B show lower vehicle volumes than does the No-Build Alternative. This pattern is potentially deceptive because it does not take into account the significant changes in ramp access/egress configurations between No-Build and Alternatives 5A and 6A/6B in the areas of Anaheim, Shoreline, and Pacific Coast Highway. If traffic on the ramps is taken into account, the general trend of higher freeway volumes for Alternatives 5A and 6A/6B is observed. For example, traffic demand is still higher in Alternative 6A/6B; however, that demand can enter the freeway further north in the build alternatives.

At the far northern end of the corridor, there tends to be little difference in volumes between Alternatives 5A and 6A/6B. This is because the Alternative 6A/6B freight corridor does not continue through the entire corridor. North of Washington, Alternatives 5A and 6A/6B have identical transportation improvements.

Figure 21 compares Alternative 6A/6B northbound truck volumes on the proposed freight corridor versus those on the I-710 general purpose lanes. Usage of the freight corridor is influenced by two factors: 1) the relative travel times and 2) access to local origins and destinations. In some cases, the combined influence of these two factors can lead to more trucks in the general purpose lanes than on the truck lanes, particularly in the midday when the general purpose lanes are less congested or in cases where there is significant demand for access to local origins and destinations that are not accessible from the freight corridor. Overall, the freight corridor is well utilized.

Figure 22 presents northbound PM peak-hour total PCEs for all alternatives. Figure 23 shows northbound peak-hour truck volumes for all alternatives. The PM peak-hour results are consistent with the daily results.

Figure 24 shows the comparison of northbound truck volumes between the freight corridor and general purpose lanes for the PM peak hour (Alternative 6A/6B). In general, truckers better utilize the truck lanes during the PM peak hour than other times of the day because congestion on the general purpose lanes makes the freight corridor comparatively more attractive. Figure 25 plots the same data, except for showing the percentage of trucks assigned to the two I-710 Alternative 6A/6B facility types (freight corridor and general purpose facility).

Figure 26 presents the northbound daily freight corridor volumes for each access or egress point. The highest volume location is where the freight corridor ends near Washington Boulevard. Most of the other points allow for only truck access or truck egress, thus the freight corridor start/end point is one of the few locations that provides for both access and egress. In addition, the start/end point near Washington Boulevard collects traffic from a potentially wide array of locations such as I-5, SR 60, and the myriad freeways traversing Downtown Los Angeles.

Figure 20. Northbound I-710 Total Daily Volume (PCE) by Alternative

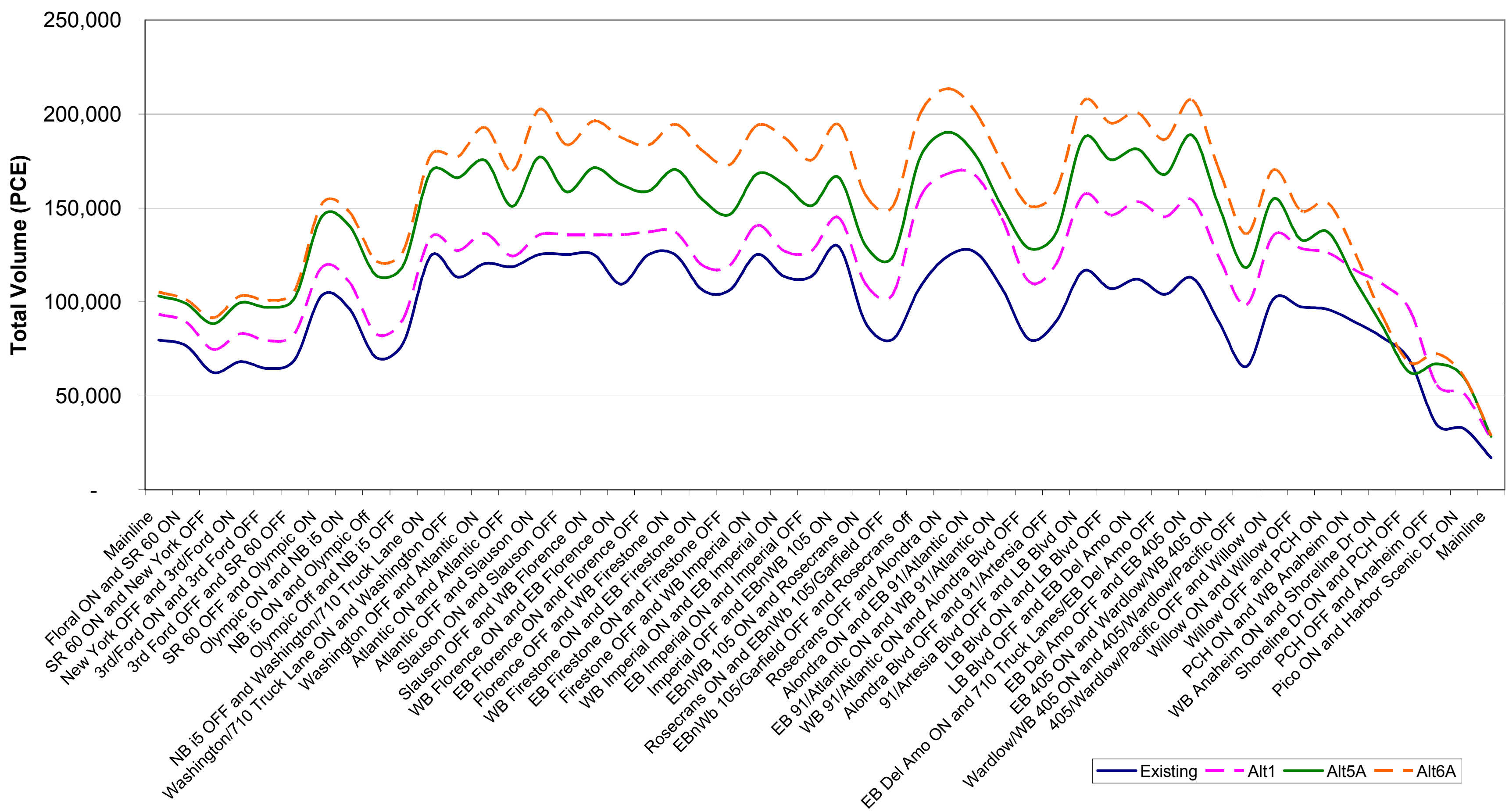


Figure 21. Northbound I-710 Daily Truck Volumes on GP and Truck Lanes, Alternative 6A/6B

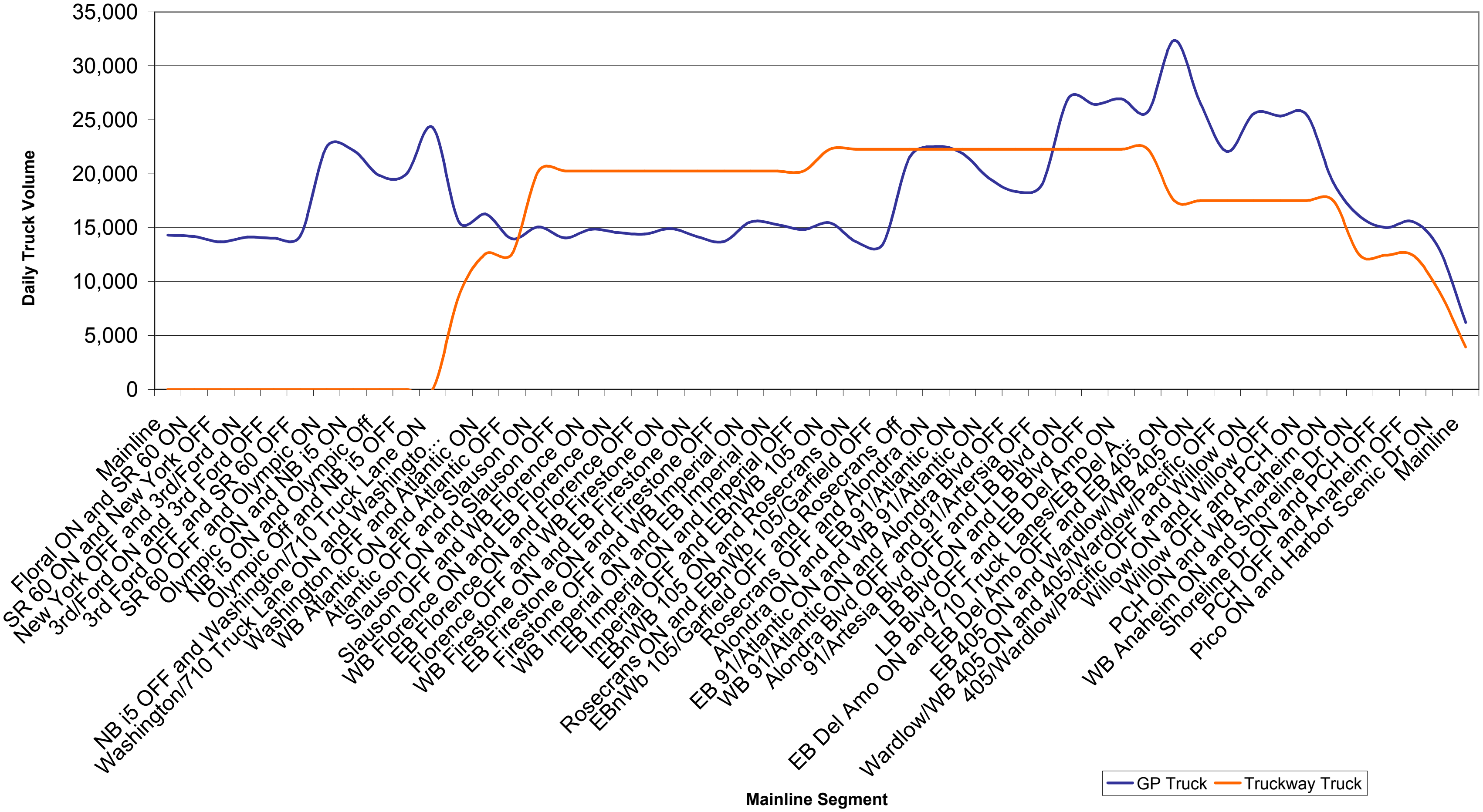


Figure 22. Northbound I-710 PM Peak-hour Total Volume (PCE) by Alternative

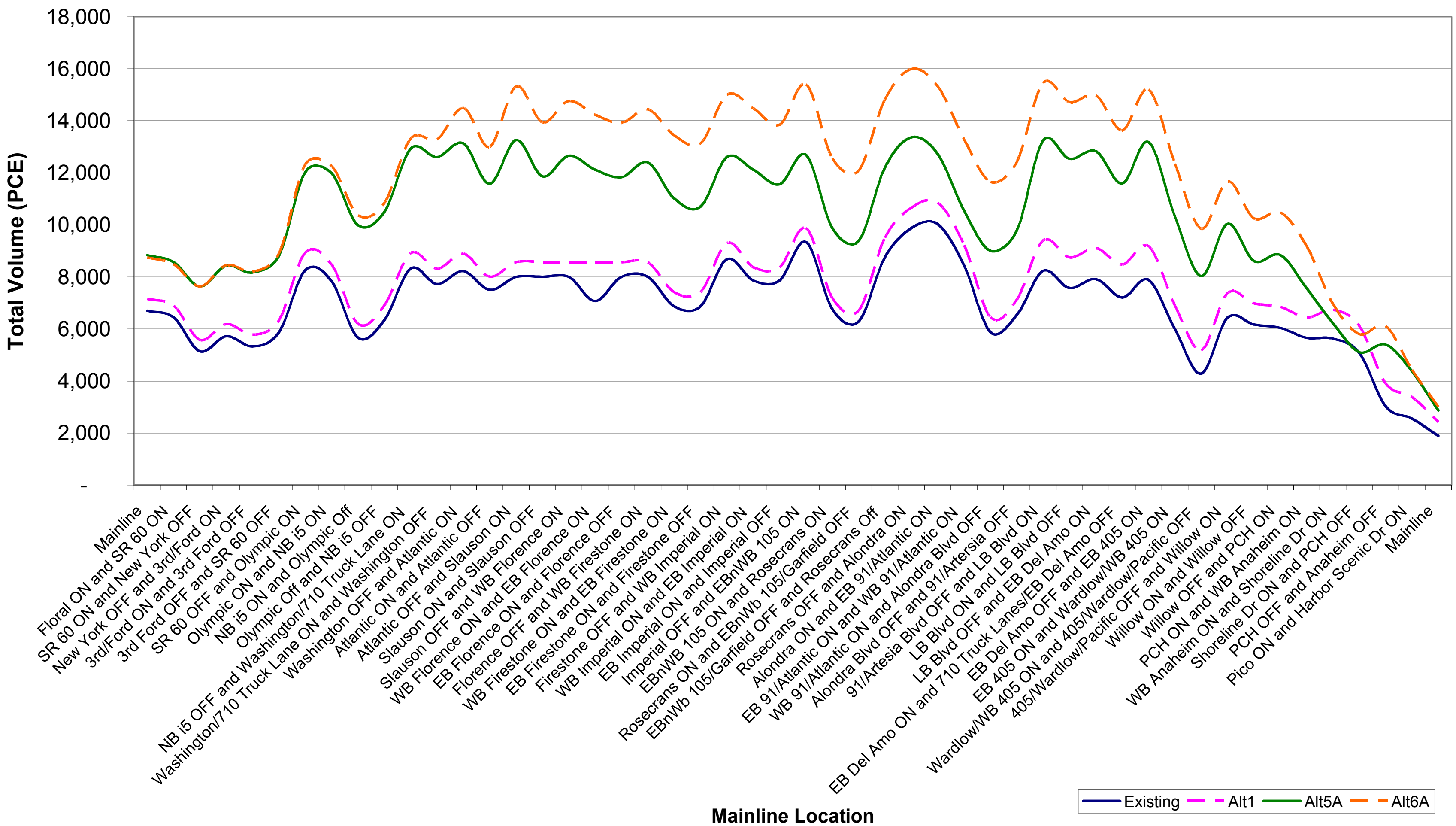


Figure 23. Northbound I-710 PM Peak-Hour Total Truck Volume by Alternative

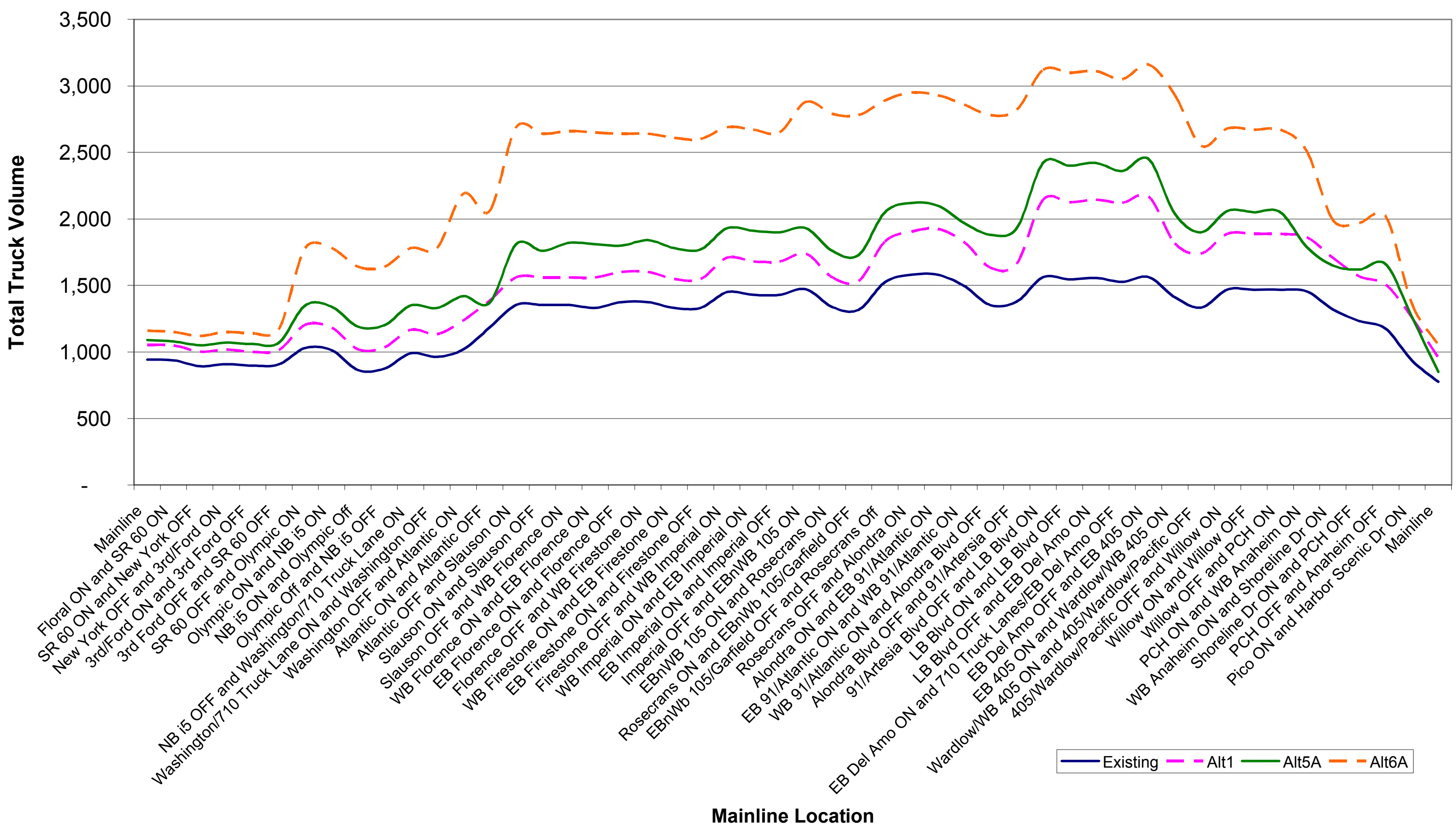


Figure 24. Northbound I-710 PM Peak-hour Truck Volume on GP and Truck Lanes, Alternative 6A/6B

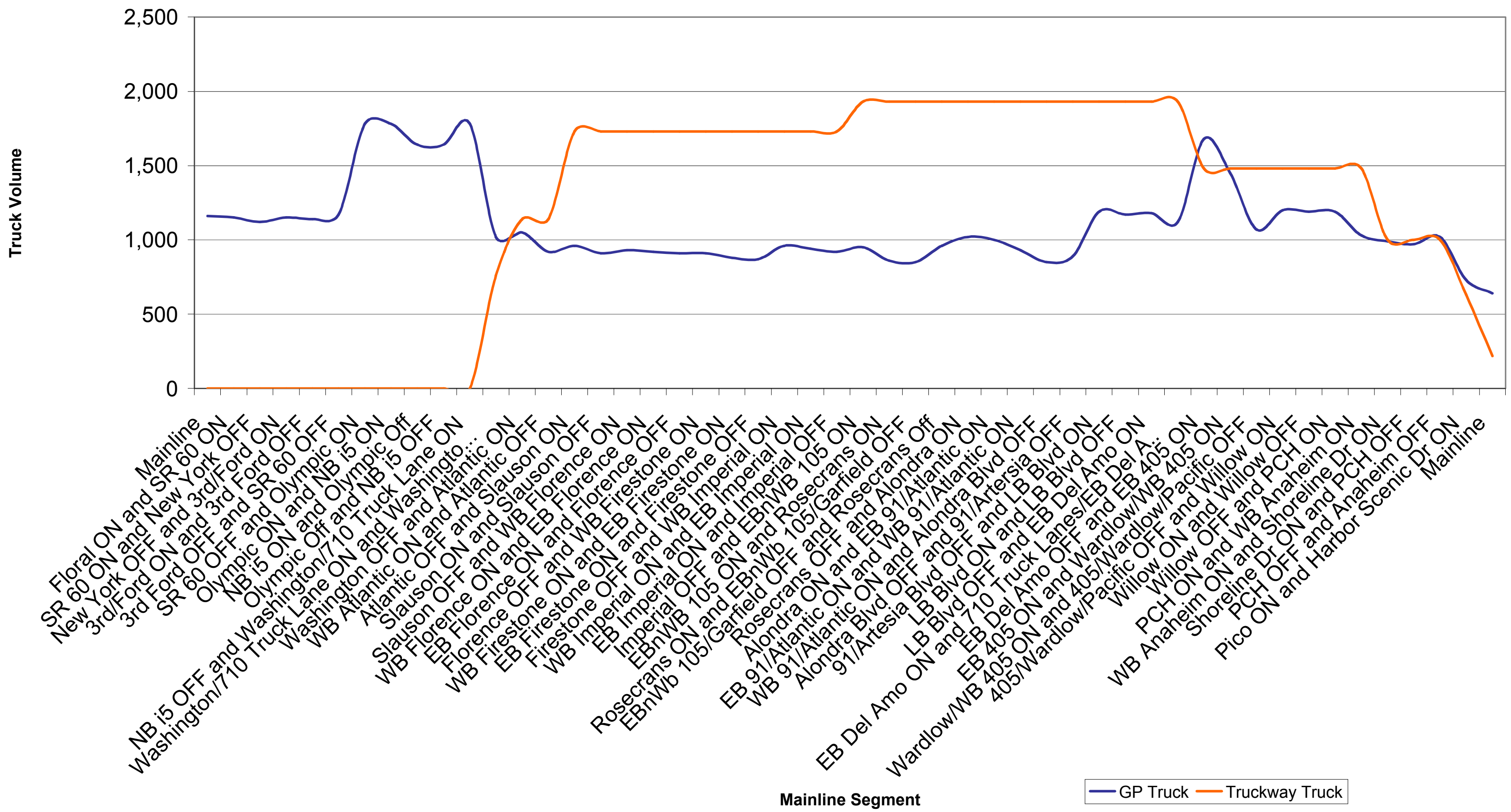


Figure 25. Northbound I-710 PM Peak-Hour Truck % Allocation to GP and Truck Lanes, Alternative 6A/6B

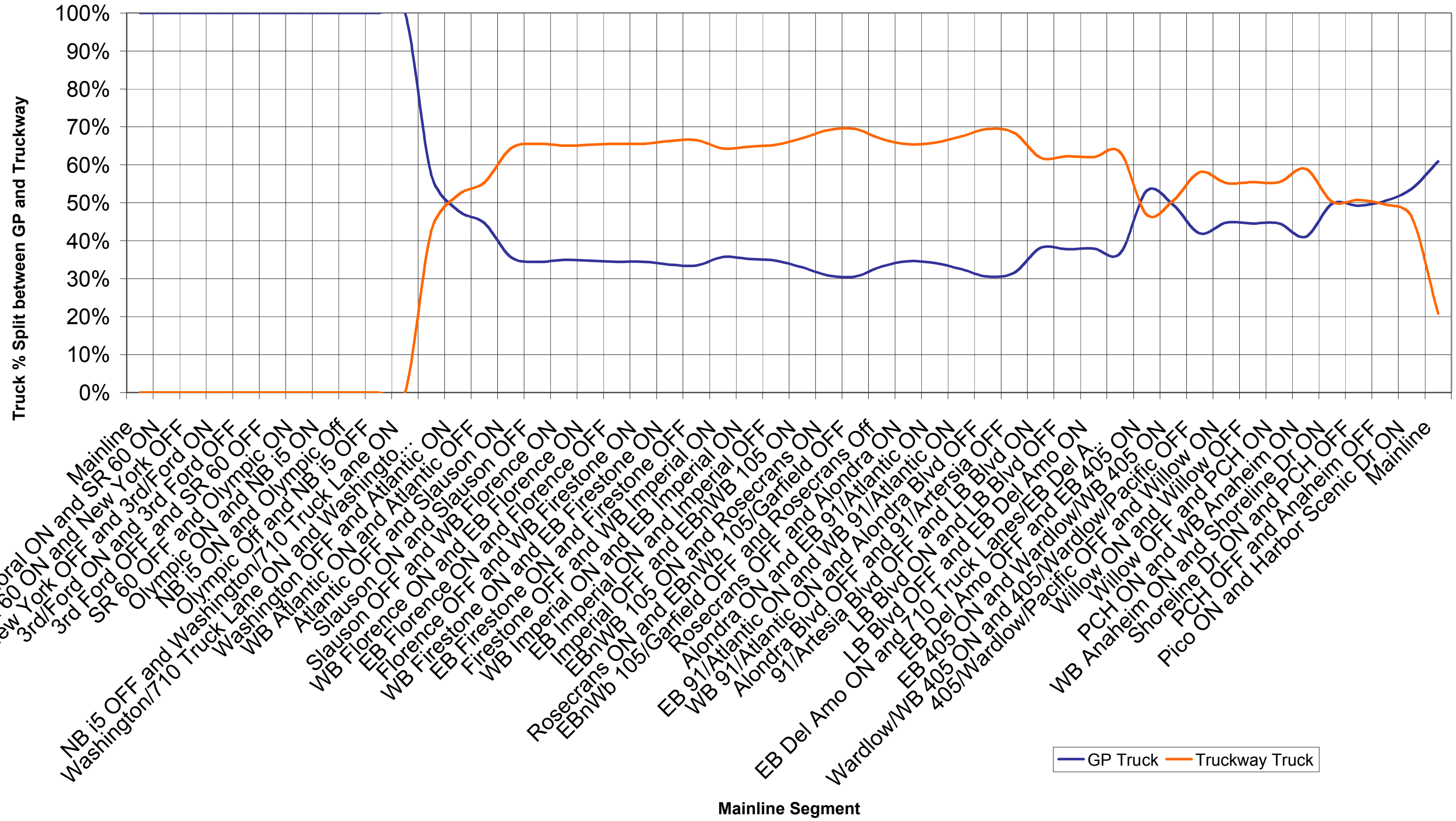
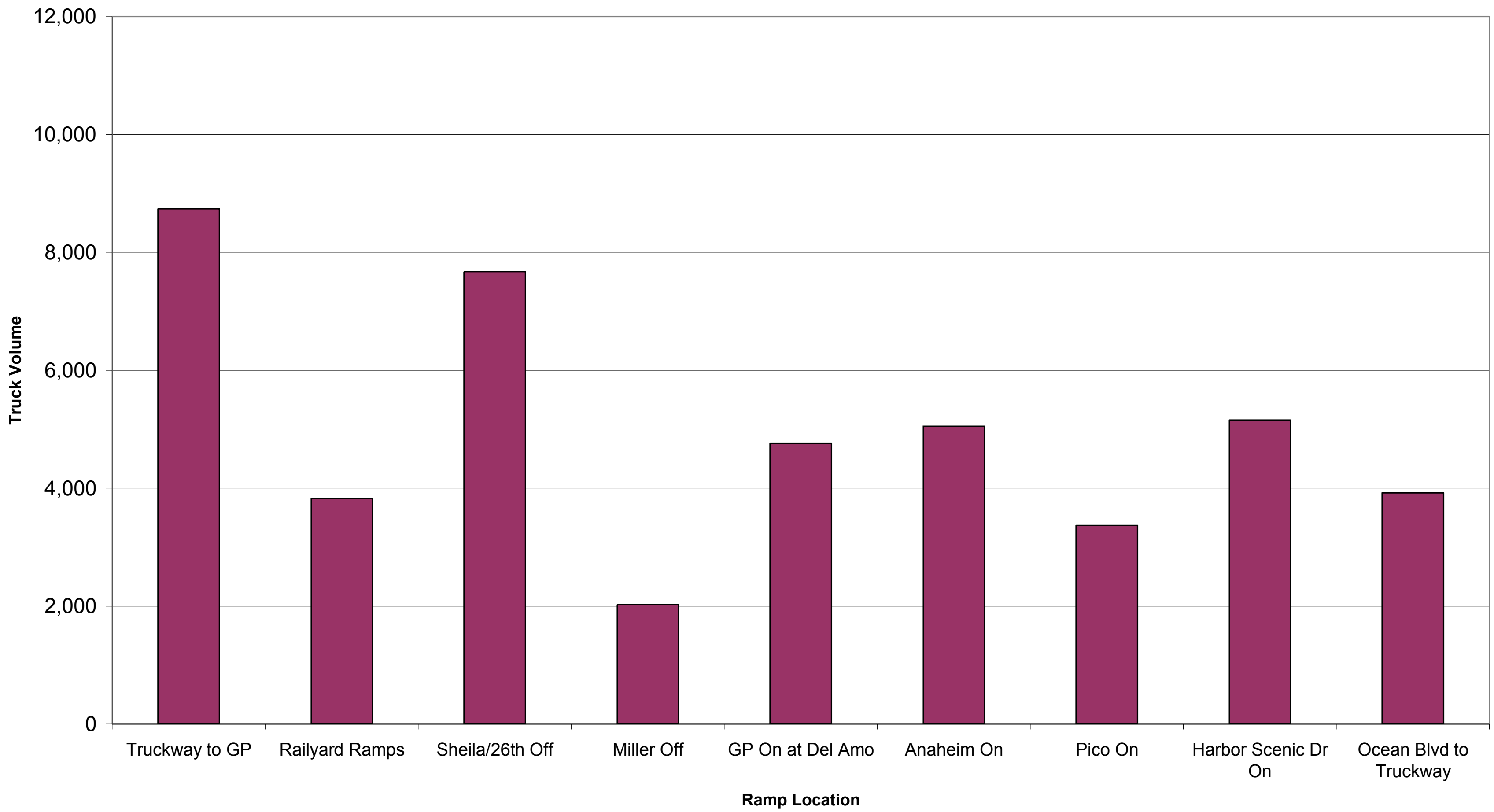


Figure 26. Northbound I-710 Daily Volumes by Truck Lane Ingress/Egress Ramps, Alternative 6A/6B



9.2 SYSTEM-LEVEL IMPACTS

Figures 27 to 29 provide information about year 2035 forecast daily vehicle volumes on the key freeways throughout the I-710 Corridor for the No-Build, Alternative 5A, and Alternative 6A/6B.[17] It should be noted that the forecast volumes reported for the I-710 freeway are from the I-710 post-processing model described in Section 7.0; whereas, the forecast volumes for all other freeways are not post-processed directly from the I-710 model results. As noted previously, total vehicle volumes for all vehicle classes on the I-710 freeway are higher in Alternative 5A as compared to No-Build, and these vehicle volumes are higher in Alternative 6A/6B than in Alternative 5A. This results from the increased capacity that Alternative 5A provides as compared to No-Build, and the increased capacity in Alternative 6A/6B as compared to Alternative 5A. Another notable finding on the I-710 freeway is the relative increase in daily port truck volumes in Alternative 6A/6B throughout the corridor as compared to both of the other alternatives. This is the result of the substantial increase in truck capacity provided by the freight corridor in Alternative 6A/6B and the reduced travel times that the freight corridor provides for port trucks.

The increase in port trucks in Alternative 6A/6B as compared to No-Build and Alternative 5A is particularly pronounced in the segment of the I-710 freeway north of I-105. This appears to reflect a preference by some trucks that would be traveling east to the Inland Empire to use the freight corridor to travel north to SR 60 rather than traveling east via SR 91/I-105 to I-605 (the specific east-west routes chosen are likely to be sensitive to the location of origins and destinations within the Inland Empire). The increased port truck volumes on SR 60 that are apparent in Alternative 6A/6B, as well as the reduction in port trucks in this alternative on SR 91, I-105, and I-605, are consistent with this conclusion. It should also be noted that this version of Alternative 6A/6B does not include direct connectors between the freight corridor and SR 91, although it is not clear from these data the degree to which this feature of the alternative contributes to the traffic patterns noted. (Alternative 6A/6B, which includes these direct connectors, will be reported in these results shortly.)

[17] This draft only includes system level data for daily volumes on freeways. Prior to completion of the final draft, freeway data will be provided for all four time periods (AM, Midday, PM, and Night) and ADT data will be provided for the key arterial streets in the study area. Data on I-710 ramp volumes are being provided with the geometric packages as forecasts supporting the design concepts and operational analysis. Arterial intersection LOS analysis will be provided in the Traffic Operations Analysis report.

Figure 27. 2035 No-Build Daily Traffic Volumes

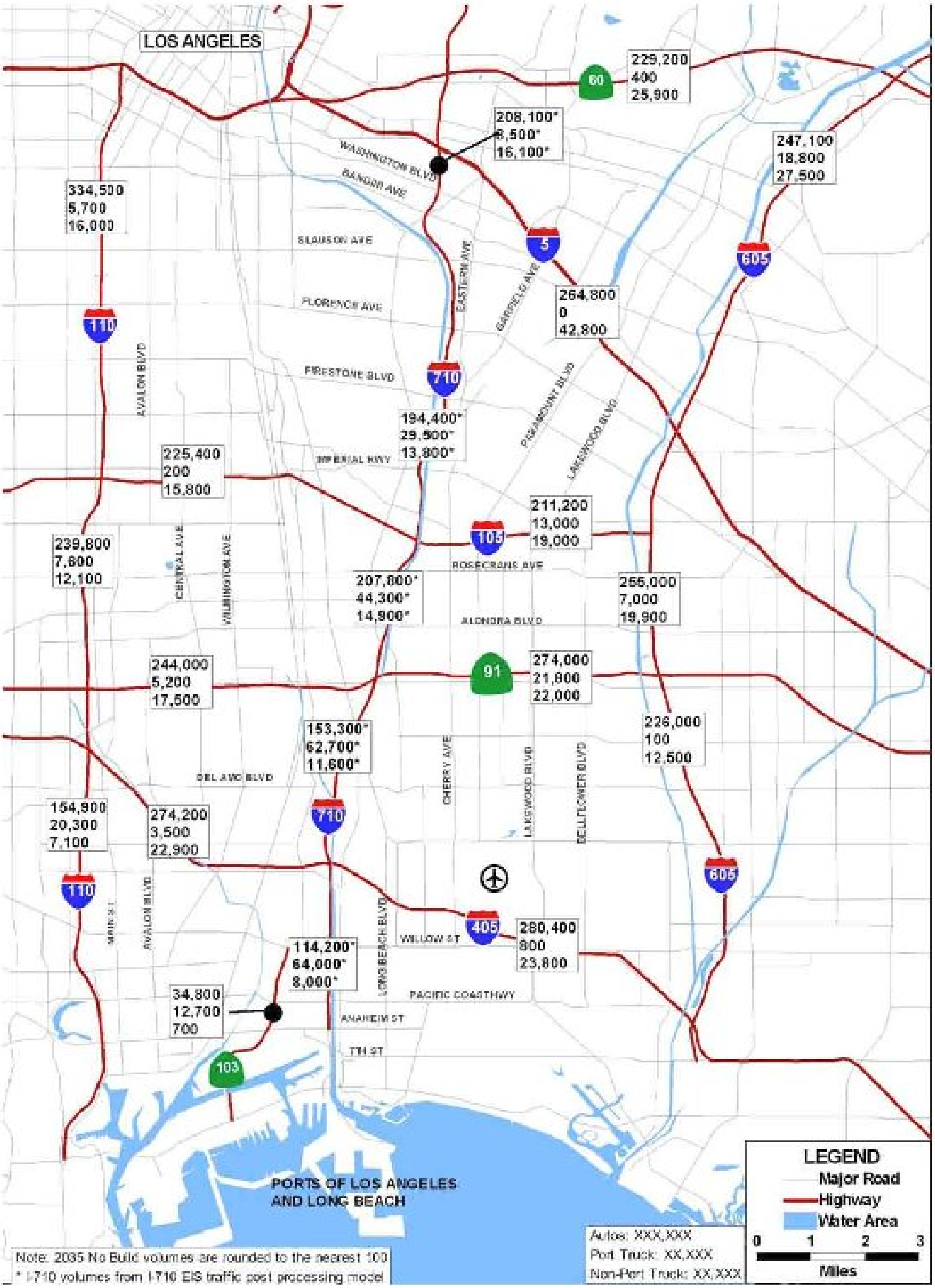


Figure 28. 2035 Alternative 5A Daily Traffic Volumes

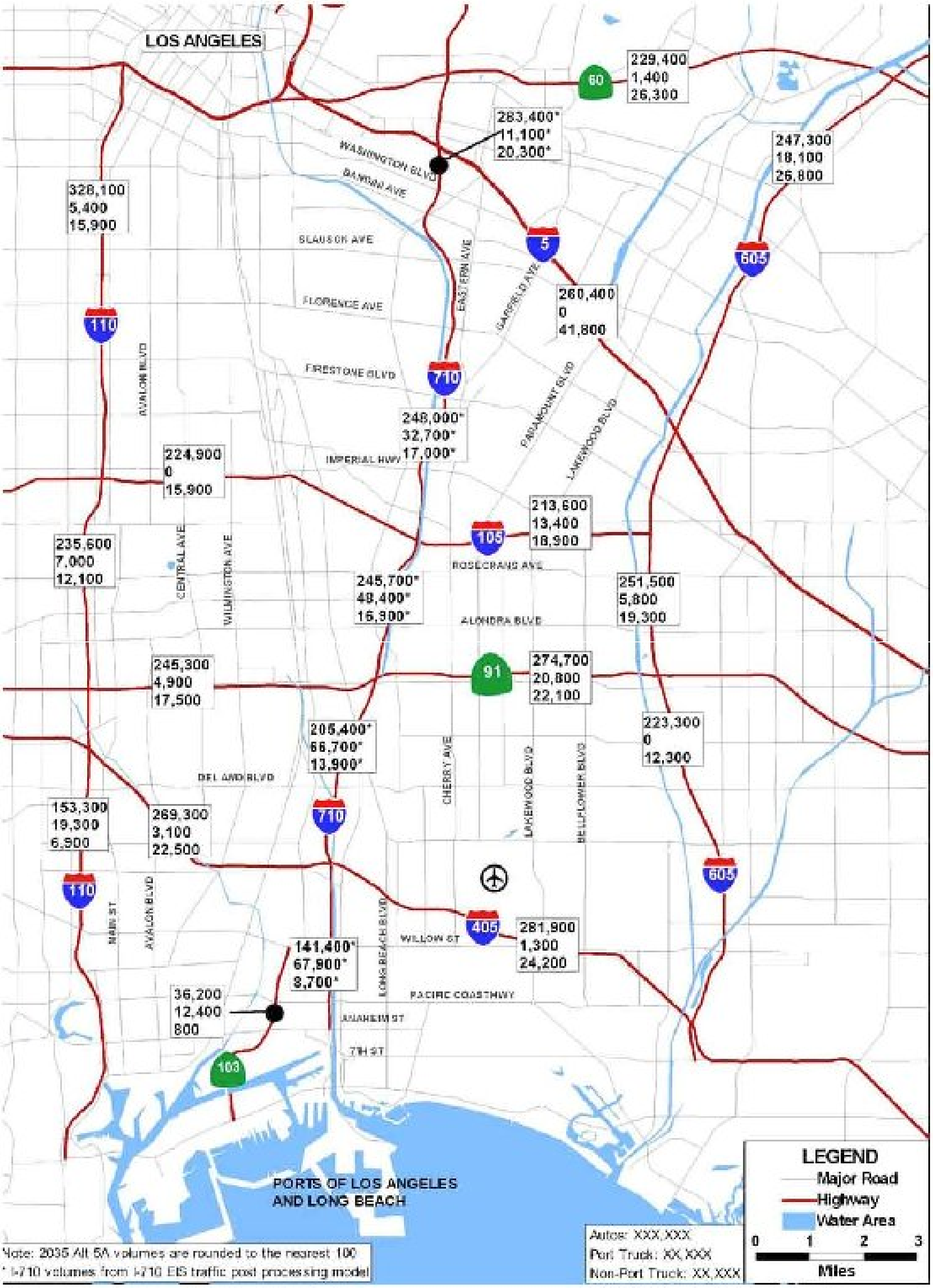
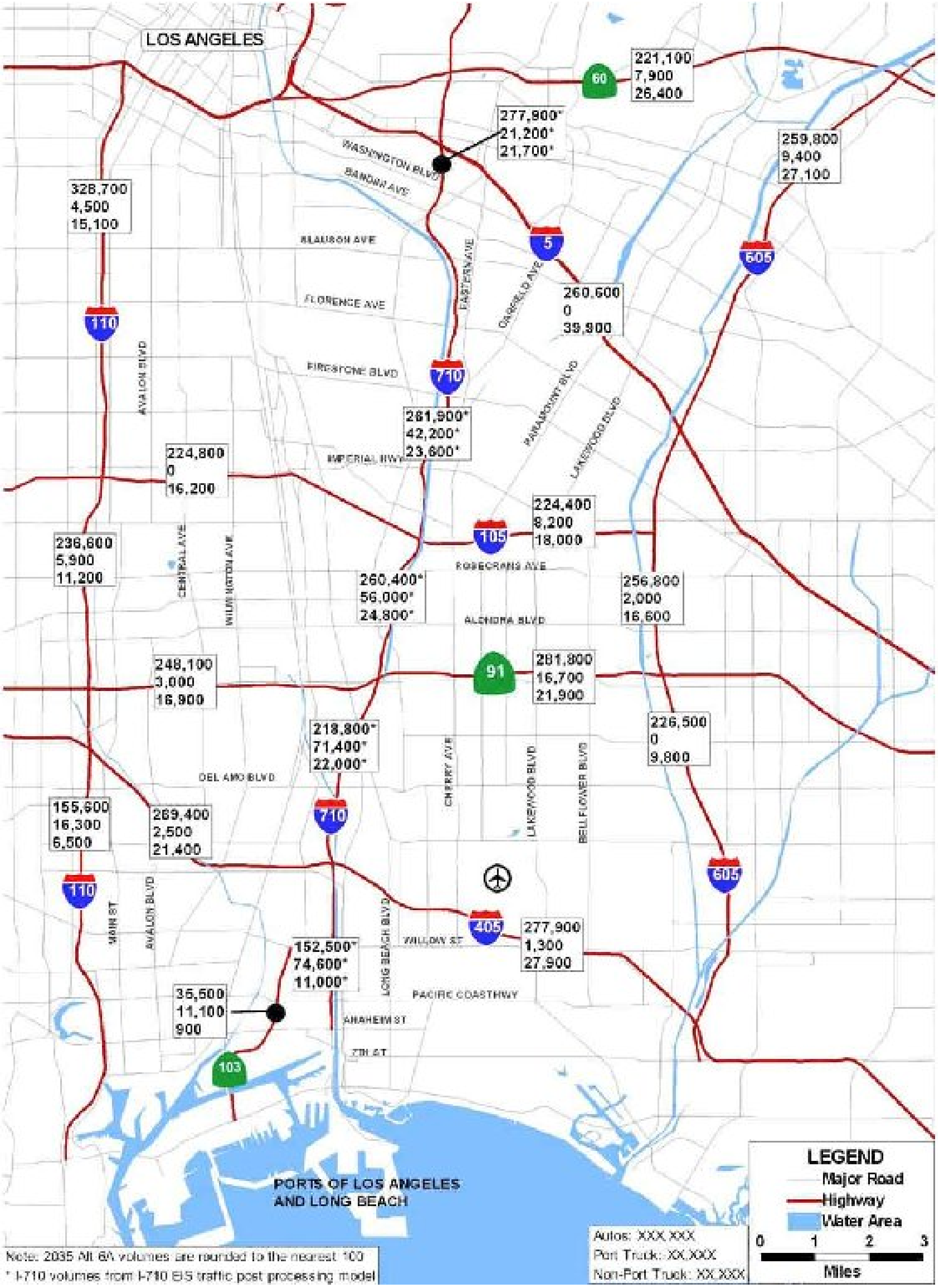


Figure 29. 2035 Alternative 6A/6B Daily Traffic Volumes



An associated traffic impact that results from the shift of port trucks to I-710 north of I-105 in Alternative 6A/6B is that capacity is freed up on I-605, I-105, and SR 91 and in all instances, Auto traffic increases on these freeways relative to No-Build and Alternative 5A. This indicates an increase in overall auto mobility in the corridor on all major freeways. Impacts on the freeways west of I-710 are less pronounced in the two build alternatives as compared to those on the east side of I-710. This is likely the result of the origin-destination patterns of those port trucks using I-110 as a primary route to and from the ports (most likely to/from the Port of Los Angeles). The build alternatives provide no changes in freeway capacity for trucks routed along I-110 and the shifts to I-710 from I-110 are relatively small for the same reason (i.e., the origin-destination patterns of those trucks using I-110).

Daily drive alone and shared ride shares of total private vehicles at selected locations along I-710 are presented in Table 19. The traffic counts collected for this study did not provide any information on the actual shares of drive alone and shared ride vehicles. As such, all information presented in Table 19 comes directly from the model outputs without any adjustments or post-processing.

Table 19. Daily Share of Drive Alone and Car Pool Vehicles on I-710

I-710 Mainline Location	Base Year (2008)		Alt-1 (No-Build)		Alt-5A		Alt-6A/B	
	DA	SR	DA	SR	DA	SR	DA	SR
Ford	65%	35%	64%	36%	63%	37%	62%	38%
Atlantic	64%	36%	65%	35%	64%	36%	64%	36%
Alondra	66%	34%	67%	33%	66%	34%	66%	34%
Long Beach Blvd	65%	35%	70%	30%	69%	31%	69%	31%
Willow	68%	32%	75%	25%	75%	25%	74%	26%

Source: SCAG 2008 RTP Model as adapted for I-710 Corridor EIR/EIS.
DA = drive alone (solo occupant) vehicles.
SR = shared ride (carpool) vehicles.

10. 2035 Warehouse Sensitivity Test

This section presents a discussion of a sensitivity test scenario that was conducted to analyze the impacts of potential changes in warehouse development patterns on truck trips in the I-710 Corridor study area. As discussed in the section on port truck trip development, the port truck trip table for local trips was developed by applying the port truck O-D distributions derived from the 2004 port gate surveys. An analysis of these trip tables indicates that around 50 percent of the port truck trips have their origins and destinations within the I-710 study area.[18] It has been observed that the study area is a built-out urban area and that future land use projections anticipate very limited (if any) growth in warehouse space. Since the amount of port-related cargo that will need to be handled at Southern California warehouses in 2035 is a substantially greater volume than was handled in 2004 (when the gate surveys were conducted), if the study area warehouses are going to be able to continue to handle the same share of the port truck traffic that they handled in 2004, there will need to be some combination of growth in study area warehouse space, increased productivity of existing warehouses in the study area, and displacement of domestic cargo by international cargo in study area warehouses. There is uncertainty as to whether and how this type of growth in study area warehouse activity could occur. SCAG is currently conducting a study of available warehouse space and likely future patterns of warehouse development as part of the Comprehensive Regional Goods Movement Study. The results of this effort will be important in guiding future planning for road access to these warehouses. In the absence of this information, it was decided that for the purposes of the I-710 Corridor Project EIR/EIS, assumptions about future warehouse activity would be made consistent with the SCAG 2008 RTP and other EIR/EIS studies being conducted in the study area (i.e., that current O-D patterns based on the 2004 port gate surveys will continue in the future). However, to inform the analysis conducted for the I-710 Corridor Project EIR/EIS, a sensitivity test was conducted to see how project decisions might be impacted by a substantially different future pattern of warehouse development. This sensitivity test examined the impact of a case in which the warehouses in the study area could only accommodate modest growth in the amount of cargo they can handle and that new inland warehouses will be required to handle the overflow. The remainder of this section of this report describes this sensitivity analysis.

As part of the analysis of potential markets for a zero emission container movement system conducted for the I-710 Corridor Project EIR/EIS, the Tioga Group estimated the number of containers that might move to new inland warehouses under the assumption of more limited capacity for growth in warehouse space in the I-710 Corridor study area. This analysis was

[18] This figure includes trips to intermodal terminals in the I-710 study area (BNSF's Hobart Yard, and UP's ICTF and East Los Angeles yards) as well as inter-terminal trips that stay within the port. This will be discussed further in this section of the report as it pertains to adjustments developed for the sensitivity analysis.

used as the basis for constructing an alternative warehouse development scenario for the sensitivity analysis.

Under the assumptions of the 2008 RTP (and incorporated in the I-710 EIR/EIS study analysis), in 2035, warehouses in the I-710 study area would be origins or destinations for 29 percent of all port truck trips. Excluding port truck trips to/from intermodal terminals and inter-terminal port truck trips within the port, the port truck trips to/from warehouses in the I-710 study area would represent approximately 41 percent of all port truck trips going to warehouses or transload facilities. In Tioga's analysis, data from the Multi-County Goods Movement Plan (MCGMAP) were used to show that given the current inventory of warehouse space by county in the SCAG region (and subcounty areas within LA County) and projected growth rates in warehouse space, there would be insufficient warehouse space in the I-710 study area to continue to absorb 41 percent of all of the forecast port truck trips to warehouses. Based on that analysis, it is estimated that the fraction of port cargo that could be handled in warehouses north of the Port in the I-710 study area could potentially drop from 50 percent (in 2004) to 25 percent (by 2035) (i.e., the percentage of port truck trip ends in the I-710 study area would drop from 50 percent to 25 percent) due to warehouse capacity constraints. The analysis also reported forecasts of future warehouse space in the region taken from the MCGMAP showing that the fraction of regional net rentable warehouse space in the Inland Empire counties of San Bernardino and Riverside would grow from 20 percent in 2005 to 44 percent in 2035, making these counties a much more likely origin/destination for port cargo inland movements in the future than the I-710 study area. There is also some likelihood that new warehouses serving Southern California might be developed in Southern Kern County.

Using these data it was possible to develop an alternative port truck trip table for the sensitivity test. The approach that was used is summarized below:

1. Cap future port truck trip ends in the traffic analysis zones (TAZs) in the I-710 study area to no more than 25 percent of total port truck trip ends outside of the marine terminals (excluding trips to off-dock intermodal terminals).

2. Calculate the difference in port truck trip ends in the I-710 in the existing port model and those capped at 25 percent of the total (the difference between 50 percent of future port trips and the cap of 25 percent), and assume these trip ends are shifted to new warehouse locations.

3. Allocate 20 percent of the shifted trip ends to an external cordon location at I-5 north (representing trips to new warehouses in Kern County) and 80 percent to a selected TAZ in Victorville (representing new warehouses in the High Desert). These locations were identified in the MCGMAP as having suitable land that can be developed for warehouse and distribution uses. It should be noted that the specific routes outside of the study area that are most affected by any assumed change in future warehouse developments

are sensitive to the assumptions made about precisely where these warehouses are located. However, the impacts on roadways within the study area are less sensitive to these assumptions. Since these future development patterns have ramifications for regional land use and transportation investment decisions, a more thorough analysis in the regional goods movement plan would be appropriate and should go beyond what is appropriate for a more limited corridor analysis.

Once these changes were made to the port truck trip table, the I-710 Traffic Model was rerun for the No-Build case and the impacts on traffic patterns were evaluated. It should be noted that for the sensitivity analysis, only the raw model results are report. The post-processor methodology was not applied to the sensitivity analysis.

The changes to the port truck table so result in a significant reduction in port trucks in the I-710 study area. Table 19 presents these changes.

Table 19. Daily Port Truck Trips in I-710 Study Area, Excluding Off-Dock Intermodal and Inter-Terminal Trips

	Port Truck Trips
2008	22,400
2035 No-Build	36,500
2035 Sensitivity Test	22,400

As shown in Table 19, it is assumed in the sensitivity test that all of the growth in non-intermodal, non-inter-terminal port truck trips between 2008 and 2035 is accomodated in warehouses outside of the I-710 study area whereas in the base case, there is forecast to be an increase of 63 percent in the number of these port truck trips in the I-710 study area.[19] This is a reduction of over 14,000 truck trips.

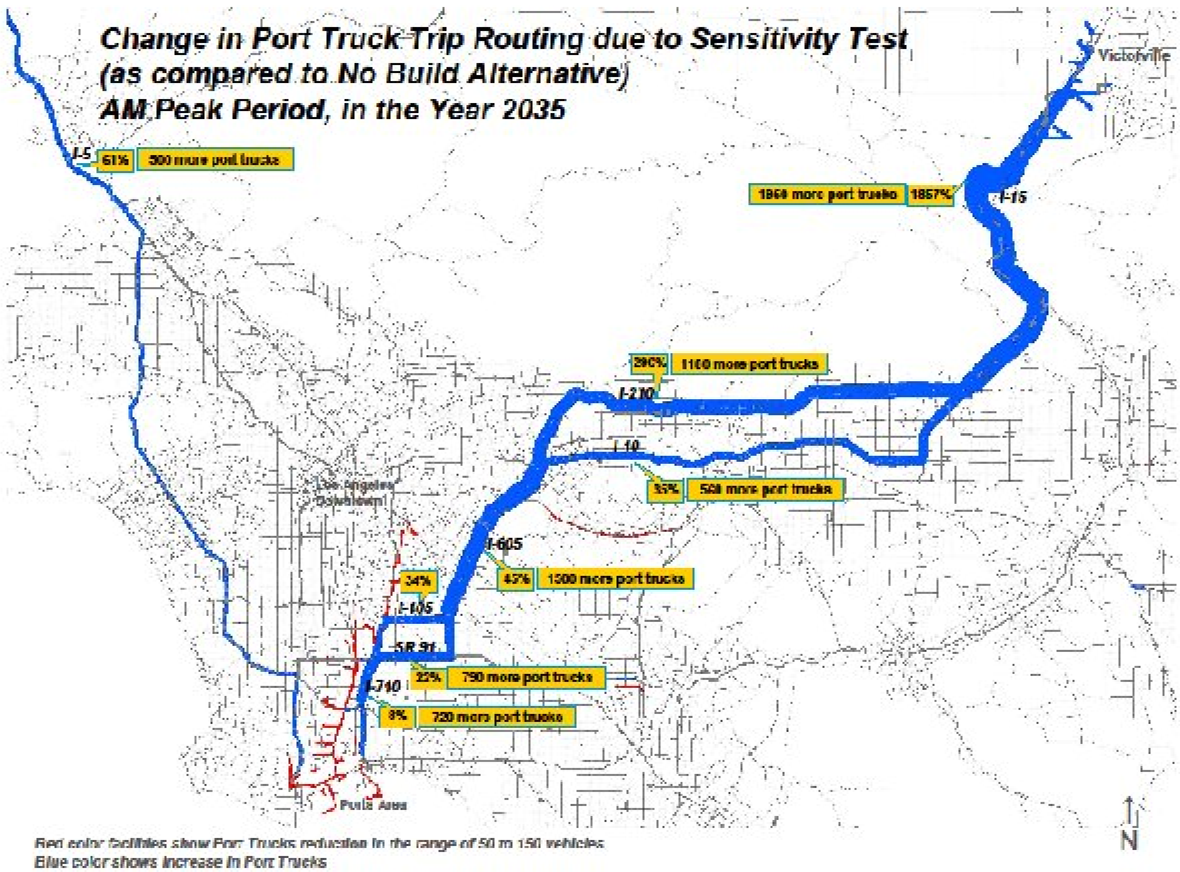
Figure 30 shows the impacts of the sensitivity test on truck trips on major freeways in the region. The results are shown for the AM Peak Period to give a picture of how the change in assumptions about warehouse distribution would affect traffic patterns during peak total traffic periods. The results show an increase in traffic on I-710 south of SR-91 of approximately 720 truck trips, bi-directionally for the three hour period. This is only an 8 percent increase in port truck traffic in this area. North of I-105, there are small reductions in port truck traffic on I-710. More significant hourly increases would be expected during the mid-day period when port truck

[19] It should be noted that a significant share of the growth in port truck trips between 2008 and 2035 is associated with growth in off-dock intermodal activity and that the 2035 assumptions are that a substantial share of this traffic moves to new intermodal terminals outside of the I-710 study area (under the assumption that SCIG and ICTF expansion are not built).

traffic peaks for the day. Reductions in port truck traffic of 50 – 150 trips are noted on several major arterial streets in the southern end of the study area. These results suggest that at least for the No-Build case and during peak traffic periods, much of the port truck traffic destined for the study area warehouses are using arterial streets and the increased flows to the northeast are being drawn from these arterial streets. Since much of the port truck traffic in the base case has origins and destinations in the south end of the I-710 study area, there is a large flow of port truck traffic drawn to I-710 and then to the north and east via SR-91, I-105, and I-605. It is possible that this increase in truck traffic on I-605 north of I-105 (see discussion below) is causing so much congestion on I-605 that at equilibrium conditions, there continue to be substantial numbers of port trucks that use I-710 north of I-105 as an alternate route to the north and east (via I-10). This would be another contributing factor to the limited change in port truck volumes on I-710 north of I-105.

Similar increases in port truck volumes as experienced in the southern part of I-710 would be experienced on I-105 and SR-91 between I-710 and I-605. The increase on port truck traffic would be most pronounced on I-605, where an increase of 1500 truck trips (or a 45 percent increase) would be experienced.

Figure 30. Impacts of Sensitivity Test on Truck Trips



The relatively small impacts of the sensitivity test on I-710 may appear counter-intuitive, however, it is important to remember that even in the sensitivity test there are a significant number of truck trips that travel to the study area when trips to the off-dock intermodal yards (ICTF, Hobart, and East Los Angeles) are taken into account.[20] The impact of congestion on I-710 in the No-Build alternative has already been noted and this results in many port trucks (particularly those moving to and from study area warehouses) using arterial streets. This raises the question of how the assumptions of about future warehouse locations might impact results for the build alternatives, where significantly more capacity is available on I-710. This

[20] It is noted that there is also a relative shift in trips to intermodal yards in 2035 as the capacity of the existing yards is reached and trips are assumed to be displaced to new intermodal terminals in the Inland Empire or the High Desert. These patterns are already reflected in all of the project alternatives as well as the sensitivity analysis.

case was not analyzed as part of this study so any discussion of potential impacts must be considered speculative. However, it is worth noting that the addition of the Freight Corridor in Alternatives 6A/B with the baseline assumptions about future warehousing does tend to divert traffic from I-605 to I-710 in the north end of the corridor. This is the result of increased capacity on I-710 and routing of some of the trucks that are moving east to SR-60 via I-710 as opposed to a SR-91/I-105 to I-605 route. To the extent that the alternative warehouse location assumptions in the sensitivity analysis tend to shift traffic to I-605 relative to the base case, it is likely that many of these trucks would choose the I-710 to SR-60 route if the Freight Corridor is built. More analysis of alternative warehouse locations would need to be conducted to determine if this would be likely to have a more significant impact on I-710 traffic patterns if the Freight Corridor is assumed as compared to the No-Build case analyzed in this sensitivity analysis.

APPENDIX A. CORRECTIONS MADE TO SCAG 2008 RTP MODEL

- Fixed the wrong direction coding in the south end from Gerald Desmond Bridge to the I-710 (link ID 92752);
- Fixed number of lanes and direction of northbound Gerald Desmond Bridge to the I-710 connection (Link ID 92706 changed from one lane to two lanes and changed to a one way link; the model network was coded as a two-way link earlier); and
- Ramp connections and number of lanes were corrected at two interchanges; I-405 and Firestone.
- At I-405 Interchange. The number of lanes was changed from two lanes to one lane on below listed link Ids:
- 16103 (Northbound I-710 to Southbound I-405);
- 127426 (Northbound I-710 to Northbound I-405);
- 16130 (Northbound I-405 to Southbound I-710);
- 16420 (Southbound I-405 to Southbound I-710); and
- 16258 (Southbound I-710 to Northbound I-405).
- Firestone Interchange. The model network was changed from full clover configuration with collector-distributor to partial clover leaf configuration without collector distributor roads.

APPENDIX B. TURN PENALTIES

Turn Penalty Location Description	Penalty (minutes)	From Link ID	To Link ID
Northbound Terminal Island Freeway @ PCH	3.0	17034	17028
Southbound Terminal Island Freeway @ PCH	1.0	129638	1658091
Northbound S San Pedro St @ Manchester Ave	2.5	103895	103914
Southbound S San Pedro St @ Manchester Ave	2.5	103914	103895
Northbound S Main St @ Rosecrans Ave	3.5	103394	103538
Southbound S Main St @ Rosecrans Ave	3.5	103538	103394
Northbound S San Pedro St @ Rosecrans Ave	2.0	103988	103858
Southbound S San Pedro St @ Rosecrans Ave	3.0	103858	103988
Northbound I-710 to I-105 off ramp	4.0	15353	15269
Southbound I-710 mainline north of I-105	5.0	14973	14991
Southbound I-710 off ramp @ Long Beach Blvd - NB	2.0	15655	92582
Southbound I-710 off ramps @ E Imperial Highway	2.0	88576	92363
Pico On ramp to Westbound Gerald Desmond Bridge	5.0	92736	2662742
Southbound I-710 off ramp @ Long Beach Blvd – SB	2.0	127416	1657652
Southbound I-710 off ramp @ MLK Blvd	1.0	14970	92386
Southbound I-710 off ramp to WB I-105	1.0	14973	14992
Southbound I-710 off ramp to Florence Ave	4.0	88574	92252
Southbound I-710 Mainline @ Slauson/Florence Ave	5.0	88574	14541
Eastbound Willow On to I-710 southbound	1.0	95441	16086
I-710 southbound off to Westbound Willow	1.0	16050	92680
Westbound Rosecrans On ramp to I-710 Southbound	2.0	1657646	15352
Southbound I-710 off ramp @ MLK Blvd	2.0	14970	92386
MLK on to I-710 southbound	2.0	92461	15209
Northbound I-710 mainline @ Rosecrans Ave	5.0	15353	15182
Northbound I-710 off ramp to westbound Del Amo	2.0	1657665	1657657
Northbound I-710 off ramp to eastbound Willow	2.0	16123	92677
Northbound I-710 off to Westbound PCH	1.0	16185	1657683
Northbound I-710 off to Westbound Anaheim	1.0	1658094	1658102
Northbound I-5 off at E Imperial Highway	1.0	16301	92729

Turn Penalty Location Description	Penalty (minutes)	From Link ID	To Link ID
Northbound I-5 off at Orr and Day Rd	2.0	15974	92586
Northbound 605 & Studebaker on to northbound I-5	5.0	15456	15453
Northbound I-5 on ramp @ Atlantic/Eastern	1.0	125324	14067
Northbound I-5 off ramp @ Atlantic/Eastern	2.0	14067	92129
Northbound I-5 off ramp @ McBride Ave	2.0	14368	92291
Northbound I-5 off ramp @ S Ditman Ave	2.5	15250	92495
Northbound I-5 off ramp @ Calzona St	2.0	15449	92556
Southbound I-5 off ramp @ S Ditman Ave	1.0	15571	92528
Southbound I-5 on ramp @ S Ditman Ave	1.5	95477	88458
Southbound I-5 off ramp @ Triggs	1.5	14603	1656299
Southbound I-5 off ramp @ Garfield Ave	2.0	13592	1656300
Southbound I-5 on ramp @ Florence Ave	0.5	95573	15599
Southbound I-5 on ramp @ E Imperial Highway	1.0	92689	16186
Northbound I-5 off ramp @ Rosemead Blvd	0.5	88472	1656301
Northbound I-5 on ramp @ Florence Ave	2.5	2667608	15521
Northbound I-5 on ramp @ Rosemead Blvd	0.5	95580	14717
Northbound I-5 on ramp @ Telegraph/E Washington Blvd	0.5	126850	13775
Southbound I-5 off ramp @ S Downey Rd	1.0	88458	97616
Southbound I-5 off ramp @ Slauson/Gage Ave	1.0	13866	92124
Southbound I-5 off ramp @ Paramount Blvd	0.5	14307	92218
Southbound I-5 on ramp @ Calzona St	1.0	95467	15571
Southbound I-5 on ramp @ Triggs St	2.0	125316	14257
Southbound I-5 on ramp @ S Eastern Ave	0.5	92110	13990
Southbound I-5 on ramp @ Orr and Day Rd	0.5	96341	88485
Southbound I-605 off ramp to I-5 & Florence	3.0	1657713	15567
Northbound I-710 off ramp to Bandini Blvd	0.5	88573	92352
I-710 Northbound on ramp from eastbound Atlantic Blvd	1.0	2666725	14817
I-710 Northbound off ramp @ N Ford Blvd	0.5	14602	92270
I-710 Northbound On ramp from W Floral Dr	2.0	92261	14527
Southbound I-710 off ramp to southbound I-5	3.0	14775	14798
Southbound I-710 on ramp from I-10 & Romana	0.5	14466	14458
Northbound I-710 off ramp @ Artesia Blvd	0.5	15700	92566

Turn Penalty Location Description	Penalty (minutes)	From Link ID	To Link ID
not applied, there is no 92533 link in the network	0.5	15536	92533
Northbound I-710 off ramp to Eastbound PCH	1.0	16134	92701
Northbound I-710 off ramp to Eastbound Anaheim St	0.5	127435	1643215
Northbound I-710 off ramp to Westbound Willow	1.0	1657668	1657673
Southbound I-710 off ramp to Shoreline Dr	1.0	1658095	1643213
I-710 Northbound north of Whittier Blvd	0.5	14729	14698
Southbound I-5 on ramp at N Lakewood Blvd	1.0	92321	88473
Northbound I-605 off ramp at Studebaker & I-5	5.0	15159	15324
Northbound I-5 off ramp to northbound I-605	0.5	15551	15531
I-710 southbound on ramp at 3rd St	1.0	92294	14615
Northbound I-710 off ramp at N Long Beach Blvd	1.0	15915	95463
Eastbound Del Amo On ramp to northbound I-710	1.0	1657666	1657665
Imperial On ramp to northbound I-710	0.5	92377	88575
Westbound Willow on ramp to southbound I-710	0.5	1657674	16121
I-105 to southbound I-710 on ramp	1.0	15203	15290
S Figueroa St at Rosecrans Ave - Northbound	2.0	105913	2663326
S Figueroa St at Rosecrans Ave - Southbound	2.0	2663326	105913
S Broadway at Rosecrans Ave - Southbound	2.5	103580	103652
S Broadway at Rosecrans Ave - Northbound	2.5	103652	103580
S San Pedro St at Rosecrans Ave - Southbound	2.0	103834	103858
S San Pedro St at Rosecrans Ave - Northbound	1.0	103858	103834
S Alameda Street at Rosecrans Ave - Southbound	2.0	106392	106480
S Alameda Street at Rosecrans Ave - Northbound	2.0	106480	106392
N Alameda Street at Rosecrans Ave - Southbound	2.0	106389	106497
N Alameda Street at Rosecrans Ave - Northbound	2.0	106497	106389
Atlantic Ave at Rosecrans Ave - Southbound	1.0	107734	2667783
Atlantic Ave at Rosecrans Ave - Northbound	1.0	2667783	107734
S Broadway at Firestone Blvd – Southbound	1.0	103280	103277
S Broadway at Firestone Blvd - Northbound	1.0	103277	103280
California Ave at Firestone Blvd - Northbound	1.0	107322	2667792
California Ave at Firestone Blvd - Southbound	1.0	2667792	107322
Garfield Ave at Firestone Blvd - Northbound	1.0	108691	108724

Turn Penalty Location Description	Penalty (minutes)	From Link ID	To Link ID
Garfield Ave at Firestone Blvd - Southbound	1.0	108724	108691
Northbound I-5 mainline between N Lakewood Blvd and I-605	2.0	15453	88472
Northbound I-5 mainline at I-710 & I-5 interchange	2.0	14517	14588
Northbound I-5 mainline between E Slauson Ave and Garfield Ave	2.0	14320	13920
Southbound I-5 mainline at I-710 & I-5 interchange	2.0	14854	14603
Southbound I-5 mainline at Eastern and E Washington Blvd	2.0	13990	13770
Southbound I-5 mainline at Garfield Ave and Gage Ave	2.0	13866	14123
Southbound I-5 mainline between I-605 interchange ramps	2.0	15376	15507
Northbound I-110 mainline at W Rosecrans Ave	3.0	12708	88572
Southbound I-605 mainline at W Rosecrans Ave	2.0	1657719	15026
Northbound I-605 mainline at W Rosecrans Ave	2.0	15056	15034
Southbound I-605 mainline at Florence Ave	2.0	15384	15306
Northbound I-605 mainline at Firestone Blvd	2.0	15099	15159

Turn Penalty Summary

Turn penalties were most often applied to the I-710 and I-5 mainline and ramp segments and a few other arterial segments. Turn penalties were applied at one location on I-110 mainline segment and at a couple of locations on I-605 mainline. No penalties were applied to I-110 or I-605 HOV lanes.

Average	1.76	min penalty
Minimum	0.50	min penalty
Maximum	5.00	min penalty

	17	movements with 0.5-min penalty
	32	movements with 1-min penalty
	2	movements with 1.5-min penalty
	34	movements with 2-min penalty
	6	movements with 2.5-min penalty
	5	movements with 3-min penalty
	2	movements with 3.5-min penalty
	2	movements with 4-min penalty
	6	movements with 5-min penalty
Total	106	penalties
	1	turn prohibition (WB Anaheim onto southbound I-710)

Other Notes:

Turn or traverse penalties were applied on movements. For example: ramp to mainline segment. Example: to traverse from link 17034 to link 17028 there is a three-minute penalty.

APPENDIX C. I-710 MAINLINE DETAILED VALIDATION STATISTICS

Table C.1 I-710 Mainline Detailed Vehicle Class Comparisons – By Direction and Time of Day

I-710 Mainline Location	Dir	AM Peak Period (6:00 a.m. to 9:00 a.m.)								
		Count			Model			Percent Difference		
		Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total
3rd Street	NB	10,800	900	11,700	13,200	700	13,900	22%	-19%	19%
	SB	12,600	1,000	13,600	14,600	700	15,200	15%	-32%	12%
Slauson Avenue	NB	21,000	2,300	23,300	24,300	1,400	25,700	16%	-38%	10%
	SB	15,400	2,600	18,000	15,700	1,600	17,300	2%	-38%	-4%
Alondra Boulevard	NB	15,200	2,500	17,700	16,300	1,500	17,800	7%	-40%	1%
	SB	21,500	3,900	25,300	19,700	2,400	22,200	-8%	-37%	-13%
Long Beach Boulevard	NB	13,000	2,800	15,800	16,600	1,900	18,500	28%	-32%	17%
	SB	16,000	3,000	19,000	17,000	3,100	20,000	6%	0%	5%
Willow Street	NB	12,500	2,300	14,800	13,700	1,700	15,400	10%	-26%	4%
	SB	13,400	2,800	16,200	12,900	3,200	16,100	-3%	13%	-1%
		PM Peak Period (3:00 p.m. to 7:00 p.m.)								
3rd Street	NB	17,200	800	18,000	20,000	1,166	21,161	16%	51%	18%
	SB	15,600	800	16,300	22,300	1,081	23,336	43%	42%	43%
Slauson Avenue	NB	22,600	2,800	25,400	31,900	3,123	35,007	41%	10%	38%
	SB	28,000	2,800	30,800	30,300	2,402	32,657	8%	-14%	6%
Alondra Boulevard	NB	26,500	2,900	29,500	28,500	4,058	32,595	8%	38%	11%
	SB	24,600	3,600	28,200	33,100	3,514	36,600	34%	-1%	30%
Long Beach Boulevard	NB	22,000	2,500	24,500	25,500	4,655	30,174	16%	86%	23%
	SB	18,000	2,900	21,000	24,000	3,990	28,009	33%	39%	33%
Willow Street	NB	15,800	2,700	18,500	19,100	4,458	23,534	21%	62%	27%
	SB	15,700	3,100	18,700	18,400	3,871	22,233	17%	26%	19%
		Midday Peak Period (9:00 a.m. to 3:00 p.m.)								
3rd Street	NB	14,900	1,800	16,800	18,200	2,100	20,300	22%	14%	21%
	SB	16,500	2,000	18,600	19,300	1,600	21,000	17%	-20%	13%
Slauson Avenue	NB	29,400	6,500	35,900	33,000	6,300	39,300	12%	-3%	9%
	SB	27,000	6,900	33,800	18,200	4,400	22,600	-33%	-35%	-33%
Alondra Boulevard	NB	27,200	7,500	34,700	17,200	7,000	24,300	-37%	-6%	-30%
	SB	26,100	8,000	34,100	21,300	7,600	28,900	-19%	-4%	-15%
Long Beach Boulevard	NB	21,000	7,000	28,000	20,900	10,100	31,000	0%	43%	11%
	SB	21,600	8,700	30,300	20,300	10,300	30,600	-6%	18%	1%
Willow Street	NB	20,600	6,100	26,800	17,500	9,600	27,100	-15%	57%	1%
	SB	18,000	6,400	24,400	17,200	11,000	28,200	-4%	73%	16%

Source: Cambridge Systematics, Inc., 2009.

APPENDIX D. I-710 RAMP/MAINLINE POST-PROCESSOR METHODOLOGY

D.1 MAINLINE AND RAMP POST-PROCESSOR METHODOLOGY

The objectives of the 2008 base year mainline and ramp post-processor was to adjust the traffic volumes produced by the model to match ground counts as closely as possible. It was not possible to match the counts for each ramp and mainline location precisely because the different counts were not all taken on the same day and the post-processed traffic volumes needed to be balanced throughout the corridor (i.e., what remains on the mainline after an interchange has to equal what was on the mainline before the interchange plus what got on at the interchange and minus what got off).

The approach used was to pick one of the five locations on the mainline for which counts were available as the starting point and to move up and down the mainline adding and subtracting volumes at each ramp based on the volumes getting on and off the mainline from the ramp counts. In order to match the traffic volumes at each subsequent mainline location for which there were counts, the ramp volumes had to be adjusted to conserve the flow. A series of iterations of this process were accomplished with a target of getting mainline volumes that were within 5 percent of the observed counts. Each iteration involved very small adjustments to the ramp volumes in order to keep the final results as close as possible to the observed ramp volumes. The post-processing was conducted for total vehicle volumes (not vehicle classes) by direction and separately for the AM, PM, and Midday periods. Once the balance baseline volumes were developed, the model vehicle classification splits were applied to these volumes to get full vehicle class information.

In order to produce forecasts for the year 2035 that were consistent with the post-processed mainline and ramp volumes, the 2035 raw model forecasts were used to generate model growth. The amount of traffic growth in the model was applied to one of the post-processed mainline locations and the same general post-processor procedure as described for the base year was performed to get balanced forecast volumes. In the case of the 2035 forecast post-processor, ramp growth from the model was applied to the post-processed base year ramp volumes to obtain the target ramp volumes that were used in the post-processor. As in the base year post-processor, the forecast year post-processor was developed separately for AM, PM, and Midday periods and northbound and southbound directions for total vehicle volumes. Night period volumes were not post-processed and direct model numbers were used. The model vehicle classification splits from the model were then applied to the post-processed results. The final numbers produced after this process were then converted to peak-hour volumes for purposes of the traffic analysis.

D.2 YEAR 2008 TRAFFIC COUNTS BALANCING PROCESS

This section explains how base year 2008 volumes on each mainline and ramp location was derived using the observed counts. Counts were not available on each mainline segment and ramps. Counts were available on six mainline locations and all ramps along the corridor.

The mainline count between Atlantic and Florence was used as the starting point mainline count and each on and off ramp counts were added to derive the next mainline segment volume. The same process was employed using all the ramp counts to derive all the mainline segment volumes. These derived mainline segment volumes were compared with the observed mainline counts as a reasonableness check.

The available mainline counts were used as the reference points and each ramp count was slightly adjusted such that the five mainline counts will match reasonably close. The target is to match the five derived mainline segment volumes to the observed mainline count within 10 percent.

After the above exercise the total vehicles on each mainline and ramp segments were derived. The below section explains the process that was used to derive the vehicle class counts on each ramp and mainline segments.

D.3 PROCESS OF DERIVING 2008 VEHICLE CLASS COUNTS ON EACH RAMP AND MAINLINE SEGMENTS

Once the 2008 Total Volumes were derived using the available ground counts and balancing process, then the vehicle class counts were derived at each mainline and ramp location using the models' vehicle class distribution. For I-710 northbound, the southernmost mainline segment was selected as the starting point and then applied the model's vehicle class distribution to the derived total volume. The model's vehicle class distribution was applied on each on and off ramp to derive the vehicle class volumes on each ramp (using the derived total volume from the above process). Where ever the model produced zero volumes on the ramps, the nearest ramp distribution was applied. These vehicle class ramp volumes were then used to derive each mainline segment vehicle volumes using the flow conservation calculations.

D.4 2035 NO-BUILD VOLUMES POST-PROCESSING

Once 2008 vehicle class volumes were derived, these were used to generate the 2035 No-Build volumes.

The Model's numeric growth between 2008 and 2035 No-Build was calculated on each ramp and mainline and this growth was applied to the 2008 volumes by vehicle class. The post-processing was employed by each vehicle class (auto, port truck and nonport truck), and then were summed together to get the total volumes.

Post-Processing Process and Calculations

Once again, the southern most mainline segment was selection as the starting point for I-710 northbound post-processing. Generic rules were applied in post-processing. If the model shows a positive growth, then numeric growth at that location will be applied. If the model shows a negative growth then 2008 volume will be used at that location.

The same logic was applied to all the ramps along the corridor and then each mainline segment volumes were estimated using the flow conservation formulae.

A few ramps were adjusted manually where the resulting number from the generic rule did not make intuitive sense. A similar process was employed for Midday and PM period and for I-710 southbound to estimate the traffic forecasts. Post-processing of model volumes was not employed for Night period. Post-processed AM, Midday, PM period volumes were added to the nonpost-processed night period model volumes to estimate the daily level forecasts.

D.5 2035 ALTERNATIVES' FORECASTS – POST-PROCESSING

For 2035 alternatives post-processing the model's numeric growth between 2035 No-Build and 2035 Project was added to the post-processed No-Build volume on each ramp. The challenge in post-processing the alternatives was addition of new ramps and modifications to the existing ramps. The growth on each comparable ramp was calculated meticulously.

Total vehicle growth and the port truck growth on mainline, from model, were calculated and added to the post-processed No-Build at mainline locations and used as the reference while post-processing alternatives forecasts. The model's v/c ratios on GP lanes and truck only lanes were used as another reference point while post-processing.

Truck-Only Lanes – Ramp Volumes Post-Processing Logic

The model's proportion (ramp volume to mainline segment volume) was multiplied to the post-processed mainline segment volume to derive the post-processed ramp volumes on the truck only lanes. The entire post-processing was done at time period level (AM period, PM period, and MD period) and the resulting numbers were factored to generate the peak-hour forecasts for traffic analyses purposes.

APPENDIX E. DESCRIPTION OF THE REDUCED SET OF ALTERNATIVES

E.1 ALTERNATIVE 1. NO-BUILD DESCRIPTION

E.1.1 Alternative 1. No-Build

Project	Description
I-710 Study Area Freeway System	
I-710	Project Limits: At Firestone Boulevard • Modify the southbound on-ramp
I-5	Project Limits: Orange County Line to I-605 • Widen by 1 HOV lane and 1 mixed flow lane in each direction (widen from 3 to 5 lanes each direction) • Reconstruct the Valley View Avenue interchange to a tight-diamond interchange • Reconstruct the Carmenita Road interchange by removing the existing 2 lane structure and constructing a new interchange with tight diamond ramps; construct a grade separation for the railroad crossing south of the freeway
I-10	Project Limits: Baldwin Avenue to I-605 • Widen for new HOV lanes, 1 lane in each direction (widen from 4 to 5 lanes each direction) • Traffic Operations System Projects
	Project Limits: Westbound-Santa Anita to I-710; Eastbound I-710 to Baldwin Avenue* • Expand capacity of the I-10 HOT lane (restriping to add a second lane for HOT lane on I-10 with buffer changes)
	Project Limits: Alameda Street/Union Station to I-605 • Conversion of HOV lanes to HOT lanes on the I-10 from Alameda Street/Union Station to I-605
SR 47	Project Limits: Terminal Island (Ocean Boulevard) to Pacific Coast Highway • Replace Schuyler Heim Bridge over the Cerritos Channel with a fixed span bridge connecting to a new limited-access four-lane elevated highway that parallels Henry Ford Avenue and that merges with Alameda Street. • Construct new two-lane flyover to divert eastbound Ocean Boulevard traffic directly to northbound SR 47 and across the new bridge

Project	Description
I-110	Project Limits: At John S. Gibson Boulevard interchange • Extend the existing off-ramp at John S. Gibson Boulevard • Modify to a 2-lane exit and re-stripe to accommodate 1 shared through and left-turn lane and 1 exclusive right lane • Create an additional left turn lane on southbound John S. Gibson Boulevard for traffic destined to port terminals • Enhances the operation and safety of the I-110/SR 47/Harbor Boulevard interchange connector
	Project Limits: 182 St./Artesia Transit Center to Adams Boulevard* • Conversion of HOV lanes to HOT lanes on the I-110 from St./Artesia Transit Center to Adams Boulevard
I-405	Project Limits: At Wilmington Avenue/223rd St. • Add 1 lane on Wilmington Avenue northbound from 223rd St. to I-405 northbound off-ramp (widen from 3 to 4 lanes) • Construct new 2 lane northbound on-ramp from southbound Wilmington Avenue • Add 1 lane to I-405 southbound on and off ramps (widen from 2 to 3 lanes)
	Project Limits: At Avalon Boulevard • Add 1 lane in northbound direction on Avalon Boulevard under I-405 (widen from 3 to 4 lanes) • Construct new 2 lane on-ramp to southbound I-405 • Add 2 lanes to northbound off-ramp (widen from 1 to 3 lanes), 2 lanes to southbound off-ramp (widen from 1 to 3 lanes) • Construct 5 lane connector road from southbound off-ramp to Avalon Boulevard (widening from 2 to 3 lanes within existing Caltrans right-of-way)
I-710 Study Area Roadway System	
Ocean Boulevard/ Gerald Desmond Bridge	Project Limits: Gerald Desmond Bridge over entrance channel • Replace existing 5 lane Gerald Desmond Bridge with new 6 lane bridge (3 lanes in each direction) • Construct the Terminal Island East Interchange and I-710 connector ramps
Harry S. Bridges Boulevard	Project Limits: Figueroa Street to Alameda Street • Relocation/consolidation of streets, street intersections, traffic channelization and signalization • Widening will be accommodated (exact number of lanes yet to be determined)
C Street	Project Limits: At I-110 Fwy on/off-ramps • Consolidate two closely spaced intersections into one (Figueroa St./C St. and Figueroa St./Harry Bridges Boulevard)
Anaheim Street	Project Limits: Farragut Avenue to Dominguez Channel • Widen existing roadway from 4 to 6 lanes

Project	Description
Del Amo Boulevard	Project Limits: At I-405 • Construct new 6 lane overcrossing
Sepulveda Boulevard	Project Limits: Alameda Street to Eastern City Limits of Carson • Add 1 lane in each direction (widen from 2 to 4 lanes)
Firestone Boulevard	Project Limits: Firestone Boulevard Bridge over the Los Angeles River • Widen on the south side and add a lane in the eastbound direction • Retrofit the bridge for compliance with the latest seismic standards
Washington Boulevard	Project Limits: Commerce/Vernon city boundary (just west of Indiana St.) to I-5 Fwy at Telegraph Road • Reconstruct and add 1 lane in each direction on Washington Boulevard from Commerce/Vernon city boundary at Vernon to I-5 Fwy at Telegraph Road (widen from 2 to 3 lanes) • Increase turn radius and medians • Upgrade traffic signals
I-710 Study Area Rail/Transit	
Exposition Line Light-Rail Transit	Light-rail transit project Phase I: from 7th St./Metro Station to Venice/Robertson Station (Metro)
	Light-rail transit project Phase II: from Venice/Robertson Station to Santa Monica (Metro)
Eastside Line Light-Rail Transit	Union Station to Atlantic Boulevard via 1st St. to Lorena St., then 3rd St. via 3rd St./Beverly Boulevard to Atlantic Boulevard (Metro)
Blue Line Light-Rail Transit	• Build a parking structure on First St. near southerly terminus of the Long Beach Blue Line in downtown Long Beach • Construct a park and ride facility in Long Beach at 3rd St. and Pacific Avenue south of the Metro Blue Line Pacific Station—include 300 to 500 parking spaces and residential/commercial development • Torrance Transit Line #6—Blue Line feeder service
HOT Lane Bus Service	• Implement new bus services to expand transit for I-10 and I-110 High Occupancy Toll (HOT) lanes*
I-710 Study Area Goods Movement	
Clean Trucks Program	• As of October 1, 2008 the POLA and the POLB will ban all pre 1989 trucks from the port terminals • By January 1, 2010 all trucks from 1989 to 1993 will be banned along with all unretrofitted trucks from 1994 to 2003 • By January 1, 2012 all trucks that do not meet the 2007 Federal clean truck emission standards will be banned
Truck Impacted Intersections	Phase I: Improve 14 intersections by installing new video detection cameras, restriping, and improving traffic signals
	Phase II: Improve 20 additional intersections by installing new video detection cameras, restriping, and improving traffic signals
Expanded Pier Pass	Adjust Pier Pass program to produce truck trip terminal gate temporal distribution of 60% day shift, 20% night shift, 20% hoot owl shift

Project	Description
Empty Container Management	Empty container management through policies and incentives (including virtual container yard)
Enhanced Goods Movement by Rail	• On-Dock Rail – San Pedro Bay Ports Rail Study Update (2008) on-dock rail improvements: − Increases operating efficiencies of existing on-dock rail facilities − Adds new on-dock rail facilities in tandem with Port terminal expansion − Includes supporting harbor district rail infrastructure − Results in an estimated increase in on-dock rail capacity from 3.8 million annual TEU (existing conditions) to an estimated 12.8 million annual TEU • BNSF/UP Mainline Capacity Improvements – freight railroad operational improvements and track capacity additions to accommodate increased levels of freight train traffic: − Colton Crossing – Grade separate the UP and BNSF tracks by building a fly over structure to carry the UP tracks over the BNSF tracks in the City of Colton. This 7,250 ft long UP grade separation would begin at Rancho Avenue and end at the Mount Vernon Avenue overpass. − Positive train control and electro-pneumatic braking technology applications to increase productivity and to permit significant increases in traffic density over existing operating practice. − BNSF triple track projects – Complete planned triple track construction on San Bernardino Subdivision between Norwalk and Fullerton and potential future triple tracking of all remaining double track segments from Los Angeles to San Bernardino. − UP double track projects – Complete planned addition of second main track on Alhambra Subdivision between Pomona and Colton and potential second main track on LA Subdivision between Mira Loma and Riverside. • Intermodal Freight Rail Facilities: − Improve operational efficiencies at the existing intermodal yards in Vernon and Commerce to increase throughput. − Provide additional intermodal terminal capacity in Southern California. Options include expansion of the City of Industry Yard and construction of the Victorville Yard
I-710 Study Area Traffic Systems and Operations	
I-710 Communication System and Closed Circuit TV System (CCTV)	Project Limits: On **I-710** from PCH to I-405 • Install facilities for traffic monitoring system and closed circuit TV system
Advanced Traffic Management Information System (ATMIS)	Project Limits: Ports of Long Beach and Los Angeles • Implement an Advanced Transportation Management System (ATMS) and Advanced Traveler Information System (ATIS) to improve traffic flow for the Ports and the adjacent regional transportation system

Project	Description
Atlantic Avenue Signal Synchronization and Enhancement Project	Project Limits: On **Atlantic Avenue** between Ocean Boulevard and Wardlow Road • Major reconstruction and minor upgrades of traffic signals along Atlantic improve traffic flow
Ocean Boulevard Signal Synchronization and Enhancement Project	Project Limits: On **Ocean Boulevard** between Alamitos Avenue and Livingston Dr./2nd St. • Reconstruct, upgrade and synchronize traffic signals along the corridor to reduce traffic congestion
Gateway Cities Forum – **Carson Street** Signal Synchronization	Project Limits: On **Carson Street** between Long Beach Boulevard to Bloomfield Avenue • Provide time-based traffic signal synchronization and upgrades to improve the overall progression of traffic along and crossing these routes
Florence Avenue Traffic Signal Communications System	Project Limits: On **Florence Avenue** between Old River School Road and Fairford Avenue • Develop Ethernet based communication network
Southeast Los Angeles County (SELAC) – Traffic Signal Synchronization	Project Limits: **I-710/Atlantic Boulevard** Corridor; **I-5/Telegraph Road** Corridor; **Lakewood/Rosemead Boulevard & Paramount Boulevard** Corridor; **I-105/ Firestone Boulevard, Imperial Highway, Rosecrans Avenue** Corridor • Implement a real-time traffic signal synchronization system to effectively managed high traffic volumes and reduce traffic congestion • Provide additional lane capacity through minor roadway widening and peak-hour parking restrictions
Wilmington Automated Traffic Surveillance and Control System/ Adaptive Traffic Control System (ATSAC/ATCS) Project	Project Limits: Southern portion of the City of LA, bounded by Sepulveda Boulevard on the north, the City of Long Beach on the east, Seaside Avenue/ Ocean Boulevard on the south, Western Avenue on the west • Implement a real-time traffic signal synchronization system to effectively managed high traffic volumes and reduce traffic congestion at 70 signalized intersections
Harbor-Gateway Automated Traffic Surveillance and Control System/ Adaptive Traffic Control System (ATSAC/ATCS) Project	Project Limits: Southerly portion of the City of LA, bounded by Manchester Avenue on the north, Alameda Street on the east, Imperial Highway on the south, Vermont Avenue on the west • Implement a real-time traffic signal synchronization system to effectively manage high traffic volumes and reduce traffic congestion at 109 signalized intersections
Gateway Cities Forum Traffic Signal Corridor Projects	Phase II: Project Limits: On **Pacific Boulevard/Long Beach Boulevard** between Florence Avenue and Willow St. • Provide time-based traffic signal synchronization and upgrades to improve the overall progression of traffic along and crossing these routes

Project	Description
	Phase III: Project Limits: On **Artesia Boulevard** between Alameda Boulevard and Valley View Avenue; on **Central Avenue** between El Segundo Boulevard to Victoria St.; on **Gage Avenue** between Central Avenue to Slauson Avenue; on **Whittier Boulevard** between Paramount Boulevard to Valley Home Avenue; on **Wilmington Avenue** between Imperial Highway to Sepulveda Boulevard • Provide time-based traffic signal synchronization and upgrades to improve the overall progression of traffic along and crossing these routes Project Limits: I-105 Corridor ITS Project, Phase 3 (arterials within the Corridor include Firestone Boulevard, Imperial Highway and Rosecrans Avenue) • Implement a traffic signal management and control system which allows jurisdictions to respond more efficiently to traffic congestion
	Phase IV: Project Limits: On **38th Street/37th Street/Bandini Boulevard** between Alameda Street and Garfield Avenue; on **Garfield Avenue** between Olympic Boulevard and Eastern Avenue; on **Studebaker Road** between Florence Avenue to Del Amo Boulevard • Provide time-based traffic signal synchronization and ITS improvements to enhance intersection operations, increase traffic mobility and relieve existing traffic congestion on surface arterials
	Phase V: Project Limits: On **Alameda Street** between Nadeau St. to Auto Drive South; on **Florence Avenue/Mills Avenue** from Central Avenue to Scout Avenue; on **South Street** between Atlantic Avenue to Carmenita Road; on **Washington Boulevard** between Atlantic Boulevard and Whittier Boulevard • Provide time-based traffic signal synchronization and ITS improvements to enhance intersection operations, increase traffic mobility and relieve existing traffic congestion on surface arterials

* FastLanes: A one year congestion reduction demonstration project which will convert high-occupancy vehicle (HOV) lanes on I-10 (Alameda Street to I-605) and I-110 (Adams Blvd to Artesia Transit Center) to High-Occupancy Toll (HOT) lanes starting December 31, 2010. Funding for this pilot program is provided through a U.S. Department of Transportation grant financed by the Federal government. Although this program is included in the No-Build project list, it is unsure as to whether it will still be in effect in 2035.

E.2 ALTERNATIVE 5A DESCRIPTION. I-710 FREEWAY WIDENING AND MODERNIZATION

E.2.1 Alternative 5A. Ten General Purpose Lane Facility

Project	Description
I-710 Study Area Freeway System	
	Includes all freeway system projects from Alternative 1 (No-Build)
I-710	Widen to 5 general purpose lanes in each direction throughout the corridor (add 1 to 2 additional general purpose lanes in each direction – varies by segment)
	Eliminate design deficiencies at the I-405 and SR 91 interchanges
	Reconfigure some local access interchanges throughout the corridor

Project	Description
	Construction of a single point interchange at Slauson Avenue
	Eliminate freeway access at various locations: • Wardlow Road to northbound I-710 • Southbound I-710 to Wardlow Road • Wardlow Road to westbound I-405
	Shift the freeway centerline at various locations to reduce right-of-way impacts
I-710 Study Area Roadway System	
	Includes all roadway system projects from Alternative 1 (No-Build)
Atlantic Boulevard	Project Limits: On Atlantic Boulevard between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Cherry Avenue/ Garfield Avenue	Project Limits: On Cherry Avenue/Garfield Avenue between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Eastern Avenue	Project Limits: On Eastern Avenue between Cherry Avenue and Atlantic Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
Long Beach Boulevard	Project Limits: On Long Beach Boulevard between San Antonio Dr. and Firestone Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
I-710 Arterial Intersections	Congestion Relief Projects: Improvements to approximately 42 intersections within the study area which includes signal phasing/timing upgrades and intersection capacity improvements (e.g., added turn lanes). This list of proposed intersection improvements will be refined pending the results of the detailed traffic forecasts to be completed after alternatives screening
I-710 Study Area Rail/Transit	
	Includes all rail/transit projects from Alternative 1 (No-Build)
Blue Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency): reduce peak headways from 6 minutes to 5 minutes and off-peak headways from 15 minutes to 10 minutes
Green Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency)
Metrolink	Increase services, upgrade the Commerce Station to 100 percent of 91 Line Service (current service ~75 percent), new connection between the Green Line Norwalk station and the Metrolink Norwalk Station, expansion of existing Metrolink service (Riverside Line and Orange County/91 Lines)
Express Bus Service	Expansion of existing high speed bus service on freeways (e.g., I-605)
	Increase in corridor Metro Rapid service frequency by about 33 percent, reduce headways by 50 percent (from 10 minutes to 5 minutes) on all Metro Rapid routes in the study area

Project	Description
Local Bus Service	Increase corridor local bus service (service frequency) by about 68 percent: for bus routes in the study area (both Metro and Long Beach Transit) reduce headways greater than 20 minutes by 50 percent and headways less than 20 minutes to 10 minutes
	Expansion of existing community bus service (e.g., local circulators Montebello Transit, Compton Renaissance Transit System, East Los Angeles Shuttle)
I-710 Study Area Goods Movement	
	Includes all goods movement projects from Alternative 1 (No-Build)
I-710 Study Area Traffic Systems and Operations	
	Includes all traffic systems and operations projects from Alternative 1 (No-Build)
Intelligent Transportation Systems (ITS)	Project Limits: I-710 study area • Expanded ITS to include entire study area • Upgraded 2070 controllers, Closed Circuit TV (CCTV), system detection • Updated communications on arterial streets and Transportation Management Systems (TMS), CCTV, Congestion Management Systems, and fiber optic Communications on the freeway mainline • Traffic Management Center upgrades and interties necessary to control and monitor the system

E.3 ALTERNATIVE 6A. I-710 FREIGHT CORRIDOR FOR ALL TRUCKS DESCRIPTION

E.3.1 Alternative 6A. I-710 Freight Corridor for All Trucks

Project	Description
I-710 Study Area Freeway System	
	Includes all freeway system projects from Alternative 1 (No-Build)
I-710	Freight Movement Corridor: • At-grade and/or elevated truck-only lanes (2 per direction) between Ocean Boulevard and the intermodal rail-yards in Vernon and Commerce • Serves conventionally-powered (diesel) trucks • Provides direct access to/from the UP and BNSF rail yards in Vernon/Commerce
	Dedicated ingress/egress points for trucks at selected locations: • Pico Avenue to northbound freight corridor • Southbound freight corridor to Pico Avenue • Anaheim St. to northbound freight corridor • Southbound freight corridor to Anaheim St. • Northbound I-710 to northbound freight corridor (north of I-405) • Southbound freight corridor to southbound I-710 (north of I-405) • Northbound freight corridor to Garfield Avenue • Garfield Avenue to southbound freight corridor • Northbound freight corridor to 26th St. • 26^{th} St. to southbound freight corridor • Optional direct connector ramps from the I-710 freight corridor to SR 91
	Widen to 5 general purpose lanes in each direction throughout the corridor (add 1 to 2 additional general purpose lanes in each direction – varies by segment)*
	Eliminate design deficiencies at the I-405 and SR 91 interchanges
	Reconfigure some local access interchanges throughout the corridor
	Construction of a single point interchange at Slauson Avenue
	Eliminate freeway access at various locations: • Wardlow Road to northbound I-710 • Southbound I-710 to Wardlow Road • Wardlow Road to westbound I-405 • Eastbound SR 91 to Cherry Avenue (with freight corridor connectors to SR 91)
	Shift the freeway centerline at various locations to reduce right-of-way impacts

Project	Description
I-710 Study Area Roadway System	
	Includes all roadway system projects from Alternative 1 (No-Build)
Atlantic Boulevard	Project Limits: On Atlantic Boulevard between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Cherry Avenue/ Garfield Avenue	Project Limits: On Cherry Avenue/Garfield Avenue between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Eastern Avenue	Project Limits: On Eastern Avenue between Cherry Avenue and Atlantic Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
Long Beach Boulevard	Project Limits: On Long Beach Boulevard between San Antonio Dr. and Firestone Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
I-710 Arterial Intersections	Congestion Relief Projects: Improvements to approximately 42 intersections within the study area which includes signal phasing/timing upgrades and intersection capacity improvements (e.g., added turn lanes). This list of proposed intersection improvements will be refined pending the results of the detailed traffic forecasts to be conducted after alternatives screening
I-710 Study Area Rail/Transit	
	Includes all rail/transit projects from Alternative 1 (No-Build)
Blue Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency): reduce peak headways from 6 minutes to 5 minutes and off-peak headways from 15 minutes to 10 minutes
Green Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency)
Metrolink	Increase services, upgrade the Commerce Station to 100 percent of 91 Line Service (current service ~75 percent), new connection between the Green Line Norwalk station and the Metrolink Norwalk Station, expansion of existing Metrolink service (Riverside Line and Orange County/91 Lines)
Express Bus Service	Expansion of existing high speed bus service on freeways (e.g., I-605)
	Increase in corridor Metro Rapid service frequency by about 33 percent, reduce headways by 50 percent (from 10 minutes to 5 minutes) on all Metro Rapid routes in the study area
Local Bus Service	Increase corridor local bus service (service frequency) by about 68 percent: for bus routes in the study area (both Metro and Long Beach Transit) reduce headways greater than 20 minutes by 50 percent and headways less than 20 minutes to 10 minutes
	Expansion of existing community bus service (e.g., local circulators Montebello Transit, Compton Renaissance Transit System, East Los Angeles Shuttle)

Project	Description
I-710 Study Area Goods Movement	
	Includes all goods movement projects from Alternative 1 (No-Build)
I-710 Study Area Traffic Systems and Operations	
	Includes all traffic systems and operations projects from Alternatives 1 (No-Build)
Intelligent Transportation Systems (ITS)	Project Limits: I-710 study area • Expanded ITS to include entire study area • Upgraded 2070 controllers, Closed Circuit TV, system detection • Updated communications on arterial streets and Transportation Management Systems, Closed Circuit TV, Congestion Management Systems and fiber optic Communications on the freeway mainline • Traffic Management Center upgrades and interties necessary to control and monitor the system

* The number of GP lanes will be evaluated and modified, if necessary, for each segment of I-710 within the project limits based upon refined traffic forecasting.

E.4 Alternative 6B. I-710 Freight Corridor for Zero Emission Trucks-Only Description

E.4.1 Alternative 6B. I-710 Freight Corridor for Zero Emission Trucks Only

Project	Description
I-710 Study Area Freeway System	
	Includes all freeway system projects from Alternative 1 (No-Build)
I-710	Freight Movement Corridor: • At-grade and/or elevated, zero emissions, truck-only lanes (2 per direction) between Ocean Boulevard and the intermodal rail-yards in Vernon and Commerce • Acts as electrified freight corridor to serve electric/battery powered trucks • Provides direct access to/from the UP and BNSF rail yards in Vernon/Commerce
	Dedicated ingress/egress points for trucks at selected locations: • Pico Avenue to northbound freight corridor • Southbound freight corridor to Pico Avenue • Anaheim St. to northbound freight corridor • Southbound freight corridor to Anaheim St. • Northbound I-710 to northbound freight corridor (north of I-405) • Southbound freight corridor to southbound I-710 (north of I-405) • Northbound freight corridor to Garfield Avenue • Garfield Avenue to southbound freight corridor

Project	Description
	• Northbound freight corridor to 26th St. • 26th St. to southbound freight corridor • Optional direct connector ramps from the I-710 freight corridor truck lanes to SR 91
	Widen to 5 general purpose lanes in each direction throughout the corridor (add 1 to 2 additional general purpose lanes in each direction – varies by segment)*
	Eliminate design deficiencies at the I-405 and SR 91 interchanges
	Reconfigure some local access interchanges throughout the corridor
	Construction of a single point interchange at Slauson Avenue
	Eliminate freeway access at various locations: • Wardlow Road to northbound I-710 • Southbound I-710 to Wardlow Road • Wardlow Road to westbound I-405 • Eastbound SR 91 to Cherry Avenue (with freight corridor connectors to SR 91)
I-710 Study Area Roadway System	
	Includes all roadway system projects from Alternative 1 (No-Build)
Atlantic Boulevard	Project Limits: On Atlantic Boulevard between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Cherry Avenue/ Garfield Avenue	Project Limits: On Cherry Avenue/Garfield Avenue between Pacific Coast Highway and SR 60 • Parking restrictions during peak periods to increase capacity by one lane in each direction
Eastern Avenue	Project Limits: On Eastern Avenue between Cherry Avenue and Atlantic Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
Long Beach Boulevard	Project Limits: On Long Beach Boulevard between San Antonio Dr. and Firestone Boulevard: • Parking restrictions during peak periods to increase capacity by one lane in each direction
I-710 Arterial Intersections	Congestion Relief Projects: Improvements to approximately 42 intersections within the study area which includes signal phasing/timing upgrades and intersection capacity improvements (e.g., added turn lanes). This list of proposed intersection improvements will be refined pending the results of the detailed traffic forecasts to be conducted after alternatives screening
I-710 Study Area Rail/Transit	
	Includes all rail/transit projects from Alternative 1 (No-Build)
Blue Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency): reduce peak headways from 6 minutes to 5 minutes and off-peak headways from 15 minutes to 10 minutes

Project	Description
Green Line Light-Rail Transit	Approximately a 16% increase in peak-period service (service frequency)
Metrolink	Increase services, upgrade the Commerce Station to 100 percent of 91 Line Service (current service ~75 percent), new connection between the Green Line Norwalk station and the Metrolink Norwalk Station, expansion of existing Metrolink service (Riverside Line and Orange County/91 Lines)
Express Bus Service	Expansion of existing high speed bus service on freeways (e.g., I-605)
	Increase in corridor Metro Rapid service frequency by about 33 percent, reduce headways by 50 percent (from 10 minutes to 5 minutes) on all Metro Rapid routes in the study area
Local Bus Service	Increase corridor local bus service (service frequency) by about 68 percent: for bus routes in the study area (both Metro and Long Beach Transit) reduce headways greater than 20 minutes by 50 percent and headways less than 20 minutes to 10 minutes
	Expansion of existing community bus service (e.g., local circulators Montebello Transit, Compton Renaissance Transit System, East Los Angeles Shuttle)
I-710 Study Area Goods Movement	
	Includes all goods movement projects from Alternative 1 (No-Build)
Electric Powered Advanced Technology Container Movement System	Project Limits: Operates between the Port marine terminals and near-dock (ICTF) and off-dock (Hobart and East L.A.) intermodal rail yards • Electric/battery powered trucks operating on I-710 freight movement lanes
I-710 Study Area Traffic Systems and Operations	
	Includes all traffic systems and operations projects from Alternative 1 (No-Build)
Intelligent Transportation Systems (ITS)	Project Limits: I-710 study area • Expanded ITS to include entire study area • Upgraded 2070 controllers, Closed Circuit TV, system detection • Updated communications on arterial streets and Transportation Management Systems, Closed Circuit TV, Congestion Management Systems and fiber optic Communications on the freeway mainline • Traffic Management Center upgrades and interties necessary to control and monitor the system

* The number of GP lanes will be evaluated and modified, if necessary, for each segment of I-710 within the project limits based upon refined traffic forecasting.